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"RED BOOKS" OF THE

BRITISH FIRE PREVENTION COMMITTEE.—No. 120.

Edited by the Executive.

364338

THE

EIGHTH ANNUAL REPORT

PRESENTED BY

THE EXECUTIVE

OF THE

British Fire Prevention Committee

With an Appendix

COMPRISING

THE EXECUTIVE'S SUGGESTIONS

ON THE

Amendment of the London Building Act.

ALL RIGHTS RESERVED.

LONDON, 1907.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(Founded 1897—Incorporated 1899).
1, WATERLOO PLACE, PALL MALL.

PRINTED BY THE ACME TONE ENGRAVING CO., LTD., WATFORD, HERTS.

"Red Books" of the

BRITISH FIRE PREVENTION COMMITTEE.—No. 120.

Edited by the Executive.

THE

Eighth Annual Report

PRESENTED BY

THE EXECUTIVE

OF THE

BRITISH FIRE PREVENTION COMMITTEE.

With an Appendix comprising the Executive's Suggestions

ON THE

AMENDMENT OF THE LONDON BUILDING ACT.

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Two Shillings and Sixpence.

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OBJECTS OF THE COMMITTEE:

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time, papers specially prepared for the Committee, together with records, extracts, and translations.

To undertake such independent investigations and tests of materials, methods and appliances as may be considered advisable.

The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.

The Committee is not responsible for the views of individual authors as expressed in Papers or Notes, but only for such observations as are formally issued on behalf of the Executive.

COUNCIL.

Chairman of the Executive:

EDWIN O. SACHS, F.R.S.Ed. Archt., Vice-Pres. Nat. Fire Brigades' Union.

PROFESSOR ARCHIBALD BARR, D.Sc., M.Inst. C.E., Glasgow University.

SIR C. PURDON-CLARKE, C.I.E., F.S.A., late Victoria and Albert Museum.

SIR JOHN COCKBURN, K.C.M.G., M.D., late Premier of South Australia.

SIR W. MARTIN CONWAY, M.A., F.S.A.

ALFRED DARBYSHIRE, F.S.A., Past-Vice-President Royal Institute of British Architects.

MAJOR-GENERAL E. R. FESTING, C.B., F.R.S., late Victoria and Albert Museum.

SIR DOUGLAS FOX, J.P., Past-President, Institution of Civil Engineers.

W. A. HART, M.V.O., Great Western Railway.

SPENCER HARTY, M.Inst.C.E., City Surveyor, Dublin.

W. T. HATCH, M.Inst.C.E., Chief Engineer, Metropolitan Asylums Board.

W. H. HUNTER, M.Inst.C.E., Chief Engineer, Manchester Ship Canal.

A. B. McDONALD, M.Inst.C.E., City Engineer, Glasgow.

C. E. NOVERRE, London Manager, Norwich Union Fire Office.

SIR W. HENRY PREECE, K.C.B., F.R.S., late Engineer-in-Chief, General Post Office. Past-Pres. Inst. of Civil Engineers.

GUY PYM, J.P., D.L., North British and Mercantile Insurance Company.

SIR BOVERTON REDWOOD, F.R.S.Ed., F.I.C., Adviser on Petroleum to the Home Office.

W. E. RILEY, F.R.I.B.A., The Architect, London County Council.

E. G. RIVERS. M.Inst.C.E., Chief Engineer, H.M. Office of Works.

ALEXANDER SIEMENS, M.Inst.C.E., Past-Pres. Inst. Electrical Engineers.

SIR JAMES WEEKS SZLUMPER, M.Inst.C.E.

SIR HENRY TANNER, I.S.O., Principal Architect, H.M. Office of Works.

SIR JOHN TAYLOR, K.C.B., Consulting Architect, H.M. Office of Works.

ROBERT VIGERS, Past-President the Surveyors' Institution.

ARTHUR WHITELEGGE, C.B., M.D., Chief Inspector of Factories, Home Office.

SIR JAMES WILLIAMSON, C.B., late Director of H.M. Dockyards.

SIR HENRY TRUEMAN WOOD, M.A Secretary, Society of Arts.

Executive:

MAX CLARKE, F.R.I.B.A.; PERCY COLLINS, F.S.S.;
J. HERBERT DYER, Vice-Pres. Nat. Fire Brigades' Union;
CHARLES E. GOAD, M.Am.Soc.C.E.; ROBERT MOND, M.A., F.R.S.Ed.
J. W. RESTLER, M.Inst.C.E., Dep.-Chief Eng. Metropolitan Water Board;
JAMES SHEPPARD, A.Inst.E.E., Surveyor North British and Merch. Ins. Co.;
OSWALD C. WYLSON, F.R.I.B.A.

Gen. Hon. Secretary:

ELLIS MARSLAND, District Surveyor.

Hon. Auditors:

HORACE S. FOLKER, F.A.I., Gen.
R. J. MAITLAND-COFFIN, Surg.-Major.

Bankers:

LONDON AND SOUTH WESTERN BANK.
Regents Street, S.W.

Testing Station.

NORTH BANK LODGE, N.W.

Offices:

WATERLOO PLACE, PALL MALL, LONDON, S.W.
(CHARLES ADAMI, *Assistant Secretary*).

THE

British Fire Prevention Committee.

THE EXECUTIVE'S ANNUAL STATEMENT OF RECEIPTS AND PAYMENTS FOR 1906.

The Executive presents, herewith, the audited Annual Statement of Receipts and Payments for the Year 1906.

On behalf of the Executive, as authorised:—

EDWIN O. SACHS (*Chairman*).

ELLIS MARSLAND (*Gen. Hon. Secretary*).

April 10th, 1907.

COMBINED GENERAL AND TESTING STATION ACCOUNT.

Summary of Receipts and Payments for the year ending December 31st, 1906.

Dr.

RECEIPTS.	£	s.	d.
To Balance brought forward from last year	90	6	0
„ Income from various sources	2075	3	7
„ Temporary Loans... ...	180	0	0
	£2345	9	7

Cr.

PAYMENTS.	£	s.	d.
By Working Expenses ...	2299	17	1
„ Special Congress Deficit of 1903	14	6	3
„ Library Sub-Committee's Account...	12	11	4
„ Balance forward to next year	18	14	11
	£2345	9	7

I have examined the above Statements of the Committee's General Fund and Testing Station Accounts, and have duly vouched the same and verified the Bank Balance, and hereby certify the correctness thereof. In addition to the Loans owing on December 31st, 1906, there were on that date debts for goods and otherwise, amounting to £1,722 18s. 4d. Two hundred and fifty-six first Mortgage Debenture Bonds of £10 each (part of an issue of £7,500 authorised by the Committee) are held as security for certain of the Loans.

(Signed)

HORACE S. FOLKER,

Hon. Auditor.

I have examined the accounts mentioned in the above certificate with Mr. Horace S Folker and such vouchers as I have called for, and I am satisfied as to the correctness of the same.

(Signed)

R. J. MAITLAND-COFFIN,

Hon. Auditor.

27th day of February, 1907.

THE

British Fire Prevention Committee.

(FOUNDED 1897—INCORPORATED 1899).

EIGHTH ANNUAL REPORT

(From January 1st, 1906, to December 31st, 1906).

PRESENTED BY

THE EXECUTIVE.

Formation

The Committee was incorporated as a Technical Society eight years back, *i.e.*, in February, 1899, after having passed through a preliminary period of nearly a year and a quarter. The actual foundation dated from November, 1897, on the occasion of the great Cripplegate Fire. A summary of the Committee's work to December 31, 1903, was prepared in the form of a first Quinquennial Report. The sixth and seventh annual reports contained summaries of the Committee's work for the years 1904 and 1905.

The year generally

The year 1906, speaking generally, was of a normal character for the Committee, in as much as its ordinary work was carried out without any such special cause for anxiety as the removal and re-equipment of its Testing Station which marked the previous year, 1905, or such special events as the Fire Prevention Congress held in London during 1903.

Although there are numerous directions in which the Committee should, if possible, actively operate in the interests of Fire Prevention, it was deemed advisable to, if anything, retard this work during 1906 inasmuch as owing to lack of funds nothing involving extraordinary expenditure could be attempted.

Tests.

Equipped with its new Testing Station, the Committee has in the main continued its investigations as to the fire resistance of materials, systems of construction and appliances, etc., on a considerable scale by undertaking various tests, namely with :—

4 floors, 6 casements of wired glazing, 2 doors, 2 roller shutters, a comparative test as to the protection of 2 window openings, and a series of fire extinguishers, involving 10 testing operations (against 17 during 1905).

The objects tested since the formation of the Committee now number 137, involving 112 testing operations.

The tests arranged for the commencement of 1907 mainly relate to Reinforced Concrete floors.

ndards of e-resistance.

The Standards of Fire Resistance for Floors, Partitions, and Doors, framed by the Committee, and accepted as "Universal Standards" by the International Fire Prevention Congress, 1903, (published in the English, German, and French languages, with English figures, weights, and temperatures, giving their metric equivalent), continue to serve as a basis of classification, both in respect to the Committee's tests and those conducted abroad.

These standards—as advised in our previous report—will require extension to include Stanchion Protection and Glazing, but it has not yet been found practicable to prepare these standards.

orts and blications.

Twelve reports on tests were issued from time to time, bringing the number of "Red Books" dealing with tests to 89. During the year, there has also been issued as a "Red Book" the Executive's Seventh Annual Report. The total number of ordinary publications, i.e., "Red Books," comprising either reports or papers on the subject of Fire Prevention, has thus risen from 104 to 117.

The Committee, owing to lack of funds, was unable during the year 1906 to issue any 4to publications, the various 4to publications intended, having had to be postponed for this reason.

The Executive's revised programme, however, is to issue on the average 12 "Red Books" and as many 4to journals as they can afford; the total issue during the current year has been 13 "Red Books" and one small special publication—the "Fables" referred to elsewhere.

e Metric stem.

The Committee has continued to adopt in its Reports on tests, the metric system introduced in 1903, side by side with the British system, in order to enhance the International utility of its publications.

reign lations.

The Italian Government, jointly with the Italian Fire Brigades' Federation, specially invited the Executive to attend the International Fire Service Congress, held at Milan from May 28th to June 3rd, 1906, under the auspices of the International Fire Service Council.

The Executive accepted the invitation, and delegated its Chairman, Honorary Secretary, and three members of the Executive, together with one past member of the Executive, to act as a Commission and attend this Congress.

Having regard to the important and highly instructive character of matters fire preventive in Italy and in certain cities en route, it was decided that this Special Commission should visit Italy, Switzerland, and the Plsass.

The cities visited by the Commission were in rotation : Venice, Florence, Rome, Milan, Lucerne, Zurich, Bâle, Strassburg and Mühlhausen. The Commissioners met with the most cordial reception, and their visit was of a highly instructive character. The technical notes and diary of the Commission were issued in the form of an illustrated record.

The Commission had the honour of being received in private audience at the Quirinal for about twenty-five minutes by His Majesty the King of Italy.

The Committee was represented at the meeting of the International Fire Service Council by three delegates. The Chairman of the Committee continued to act as Vice-President of the International Fire Service Council.

The relations between the Committee and the allied and similar Societies abroad continues to be most cordial.

The British Fire Service.

The Committee continues to be in close relation with the National Fire Brigades' Union and the Association of Professional Fire Brigade Officers.

Various Services Rendered to Public Authorities.

The Committee has continued to render various services to the public authorities when called upon.

The Executive prepared, at the suggestion of the London County Council, additional observations in respect to the proposed general amendment of the London Building Act. (*See Appendix*).

Fables for Children.

The fables for children obtained in competition, and referred to in the seventh annual report, have been printed and distributed in considerable numbers in pamphlet form.

This has been possible, thanks to the generosity of a special donation contributed by the widow of one of the founders of the Committee, namely, by Mrs. Arthur Cates.

The principal money prizes for the competition were kindly presented by a Canadian member of the Executive, Mr. Charles E. Goad, M.Am. Soc. C.E., and by Mr. Percy Collins, F.S.S., who contributed an extra money prize for the best Colonial Fable.

It should be of interest to note that the Victorian and the West Australian Governments have authorised the issue of the fables in suitable official publications and reading books, for the benefit of children in their respective Colonies.

The Committee's International Fire Library.

The nucleus of books which existed at the Committee's office has been developed into a library of considerable technical importance. Now known as the "International Fire Library," it has been increased, during 1906, by the addition of numerous items.

The number of technical journals kept on file at the Committee's offices in connection with the Library, is over 100, apart from the official Journals of Transactions of technical societies.

Collections

The Committee has continued its collection of relics and photographs of materials tested, with a view of eventually forming a Museum, and is anxious to obtain good photographs and plans of notable fires for this collection.

Exhibitions.

The Committee at the request of the Hon. British Commissioner of the International Exhibition at Milan arranged a Loan Exhibit of plans, models and photographs which was supplemented by an interesting collection of paintings and prints put at the disposal of the Committee for the purposes of this Exhibition by a member of the Executive, Mr. Percy Collins, F.S.S.

The Committee also sent a collection of photographs to New Zealand for the Christchurch International Exhibition, N.Z.

Subscriptions to the Publications and Journal by Non-Members.

The Executive, having found that there was a certain demand for the regular perusal of its publications outside its own membership, authorised late in 1904, that subscriptions to the Committee's publications, "Red Books" and Journals can be accepted, such subscription, however, not according the subscriber any other rights beyond the receipt of such of the Committee's printed matter as is public.

This arrangement for subscribing to the Committee's publications, it is hoped, will appeal to public authorities and other corporate bodies, who, though generally precluded from becoming members of a technical society, are thus able to obtain the necessary information by ordinary subscription to the printed matter at £2 2s. per annum.

During 1906, thirty-three subscriptions for publications were received, including several from public authorities and from fire insurance offices.

ork of the ecutive embers.

There were nine meetings of the Executive in 1906 (against fourteen in 1905). The number of Sub-Committee meetings held, were as follows: General Purposes four (against eight); Testing Arrangements, two General and nine Special = eleven (against

eight). The Parliamentary Sub-Committee had a joint meeting with General Purposes Sub-Committee.

There were 6 testing days during the year (against 8 in 1905), requiring the attendance of the members of the Executive.

There were 11 special Sub-Committees entrusted with the conduct of and report upon tests (against 17 in 1905), and the average time occupied by these Sub-Committees was two afternoons upon each test.

Voluntary Work.

All this work, as has already been indicated in previous reports, is done voluntarily, and in all instances the members bear their own expenses

Results of Tests in Tabular Form.

Tables as to the comparative results of the Committee's tests have been prepared by the Gen. Honorary Secretary, and will shortly be issued.

The Commitee's Articles.

Some alterations are under consideration in respect to the Committee's Articles, to meet the Committee's requirements, having regard to the extended area over which the membership has now spread.

Special Sections.

Arrangements are being made for the formation of special Sections for members in the Colonies, and the New Zealand Section, which was started in 1905, with Mr. Arthur L. Parsons (Christchurch, N.Z.) as Honorary Sectional Secretary, has now 25 members.

New Honorary Corresponding Members Abroad.

The Committee has elected five Honorary corresponding members during the year, mainly in connection with the visit of the Special Commission to Italy.

The names of the new Honorary Corresponding Members are as follows: Captain Rambaldo Gaspari, Inspector of Municipal Fire Watch, Venice; Professor Grassi, Lecturer for the Society of the Encouragement of Arts, Milan; Hector de Magistris, Second Officer, Fire Brigade, Rome; Ugo Penné, Secretary to the Italian Fire Brigades' Federation, Milan;—Villa, Third Officer, Milan Fire Brigade, Milan.

Members.

The ordinary membership of the Committee numbers 340. There are also 3 honorary members and 58 hon. corresponding members. The total membership is 401.

Non-Member Subscribers.

The number of Subscribers (non-members) is 92.

Financial Arrangements.

The financial arrangements of the Committee continued to give the Executive cause for anxiety, more particularly owing to the heavy capital expenditure that was necessary in 1905, consequent upon the removal and extension of the Committee's Testing Station.

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There is, however, some slight relief in the anxiety, due to the fact, that as far as the actual revenue and expenditure for the current year's working was concerned, there was no deficit for the actual twelve months' working of 1906. This is the third occasion in the history of the Committee that there has been no deficit on the actual working of the year, the first occasion having been that of 1904. The income and expenditure of the actual twelve months' working of 1906 *(as distinct from Capital outlay)* was as follows :—

SUMMARY OF INCOME AND EXPENDITURE.

Year ending 31st December, 1906.

Dr. **Cr.**

INCOME.	£ s. d.	EXPENDITURE.	£ s. d.
To Reserve brought from 1906	300 0 0	By Administration Expenses	537 5 10
„ Subscriptions and Sundries	529 17 6	„ Library Sub-Committee	12 11 4
„ Publication Section ...	363 1 5	„ Publication Section ...	435 7 4
„ Testing Station receipts less reserve carried forward to 1907 for expenses of tests not completed at date ...	1002 11 8	„ Testing Station Expenses	917 16 4
		„ Testing Station Depreciation	200 0 0
			2103 0 10
		By Balance, being excess of Income over Expenditure	92 9 9
	£2195 10 7		£2195 10 7

The deficit, as is well-known, during the first five years has been very considerable, the Committee's work having been mainly dependent upon the standing and temporary loans provided by individual members and past members of the Executive.

upport from overnment epartments.

One of the most important matters which should be of some moment to the Committee's future has, however, been the subscription to its works by three Government Departments, namely : The War Office (by order of the Army Council) ; The Admiralty (by order of the First Lords) ; and H.M. Office of Works (by order of the First Commissioner, and at the instance of the General Post Office).

The Subscriptions are of course small, considering the National character of the work but the principle of the Government recognising the utility of the Committee's efforts is one that at a later day should have far-reaching effect.

uggested overnment rants.

The Executive are of opinion that, considering the national character of the work of the Committee, a grant from the Government could be advantageously applied in the interests of the public at large.

What the total expenditure in the Committee's Testing Stations has been is best gathered from the following statement. The Committee's Capital Expenditure.

	£ s. d.	£ s. d.
Cost of establishmen' of No. 1 Station	1210 19 8	
Less written off	750 0 0	
Leaving parts in use at No. 3 Station valued at ...		460 19 8
Cost of establishment of No. 2 Station	1679 18 10	
Less written off	1335 19 9	
	343 19 1	
Less written off 1905 as per Income and Expenditure a/c	200 0 0	
Leaving parts in use at No. 3 Station valued at ...		143 19 1
Cost of establishment of No. 3 Station...		1264 18 0
No. 3 Testing Station in operation Jan. 1st, 06		£1869 16 9
Less written off in 1906 as per Income and Expenditure a/c		200 0 0
No. 3 Testing Station in operation Jan 1st, 07 ...		£1669 16 9

The Executive's Annual Statement of Receipts and Payments for the year 1906 is appended with Hon. Auditors' certificate. Accounts.

The Committee specially regret to record the loss of the following members by death since January 1st, 1906, namely :— Members Deceased.

Lionel J. Langridge, A.M.Inst.E.E., formerly Member of the Executive.

Wm. Paterson, Chief Officer, Fire Brigade, Glasgow.

The loss of these gentlemen by death is a matter of the greatest regret to the Executive for each in their different spheres, have been of considerable assistance to this Committee.

The Executive has, as heretofore, had considerable assistance from members and others interested in the various sections of the Committee's work, which kind assistance they wish to specially acknowledge.

On behalf of the Executive, as authorised :

EDWIN O. SACHS (*Chairman*).

ELLIS MARSLAND (*Gen. Hon. Secretary*).

1, Waterloo Place,
Pall Mall, London, S.W. *10th April, 1907.*

SUGGESTIONS FOR AMENDMENTS

OF THE

LONDON BUILDING ACT, 1894,

AND

LONDON BUILDING ACT, AMENDMENT ACT, 1905,

BY THE EXECUTIVE OF THE

BRITISH FIRE PREVENTION COMMITTEE

(Founded 1897, incorporated 1899).

—o—

THE CLERK

TO THE LONDON COUNTY COUNCIL,

SPRING GARDENS, S.W.

DEAR SIR,

Re THE LONDON BUILDING ACT AMENDMENT BILL.

In further reference to ours of May 31st, 1905, in reply to yours of April 7th, 1905, intimating that your Council would be pleased to receive observations on the London Building Act Amendment Bill, we are desired to make some additional suggestions based in the main on a closer examination of the Bill in conjunction with the Amendment Act as passed, and upon the additional experience obtained by this Committee during their investigation of questions of fire prevention and the fire resistance of materials and systems of construction. We are also to hand you herewith a copy of the Bill with our previous, as well as, present suggestions annotated in red ink.

SUGGESTION I. *re* THE FIRST SCHEDULE.

My Executive wish to emphasise with all due respect that the Schedule of Fire Resisting Materials, as previously conducted, should clearly discriminate between "fire resisting materials" and materials that are "incombustible." The Schedule of the Acts of 1894 and the Amendment Act 1905, are somewhat misleading in this respect. The Schedule as it stands compels the use of materials for fire resisting purposes that are entirely unsuitable and frequently dangerous, and the opportunity of the impending Bill, we would suggest, should be used to remedy this defect.

We venture to suggest that the Schedule should read as follows, re-utilising as far as possible the wording of the existing first Schedule of the Amendment Act, 1905.

New features in the suggested schedule are :—

(*a*) A more detailed description of concrete where used as a "fire-resisting" material, the description being based on the series of investigations conducted by this Committee. (See Reports

Nos. 101 and 107 enclosed). Thames Ballast should not be permissible in concrete intended to be fire-resisting, and other aggregates should pass the mesh described and have Portland Cement.

(*b*) The inclusion of flame-proof wood as an equivalent for teak, oak, jarrah and karri, and other hard woods, and a definition of flame-proof wood. This inclusion is based on the Com mittee's investigations as also the fact that there are now several systems of obtaining flame-proof wood available in the open market. Flame-proof wood is recognised by the Board of Trade for Tube Railways, by the London County Council for its own tramways. (Reports Nos. 36 and 37 are enclosed).

THE FIRST SCHEDULE.

A. The following materials shall for the purposes of this Act be deemed to be *incombustible.*

(I) For general purposes :

(1) Brickwork built in mortar or cement.

(2) Granite and other stone suitable for building purposes by reason of its solidity and durability.

(3) Iron, steel, and copper.

(4) Slate tiles, brick and terra-cotta when used for coverings or corbels :

(5) Paving stones when used for floors :

(6) Concrete, composed of broken brick, tile, stone chippings, ballest, pumice or coke breeze and lime, cement or calcined gypsum.

B The following materials shall for the purposes of this Act be deemed to be fire-resisting :—

(I) For general purposes.

(1) Brickwork constructed of good bricks, well burnt, hard and sound, properly bonded and solidly put together.

(*a*) with good mortar, compounded of good lime and sharp sand, hard clean broken brick, broken flint, grit or slag : or

(*b*) with good Portland Cement : or

(*c*) with good Portland Cement, mixed with sharp clean sand, hard clean broken brick, broken flint, grit or slag.

(2) Paving stones, when used for floors over arches, but such paving stones not to be exposed on the under side, and not supported at the ends only.

(3) Concrete, composed of broken brick, furnace slag, furnace clinker, well burnt coke, breeze, pumice, burnt ballast, broken to pass through a one inch ring, mixed with Portland Cement, in the proportion of not less than 5 to 1.
Note :—Sand may be used, but most not exceed one-third of the aggregate.

(4) Any combination of concrete as in sub-section (3), and steel or iron or reinforced concrete.

(II) For special purposes :—

(1) In the case of doors and shutters and their frames, oak, teak, jarrah karri, or other hard timber, or flame-proof wood, not less than two inches thick ; the frames being bedded solid to the walls or partitions :

(2) In the case of staircases and landings, oak, teak, jarrah karri, or other hard timber, or flame-proof wood, the treads, risers, strings, and bearings being not less than two inches thick, and the ceilings and soffits, if any, being of plaster or cement :

(3) Oak, teak, jarrah karri and other hard timber or flame-proof wood when used for beams or posts, or in combination with iron the timber and the iron (if any) being protected by plastering or other incombustable or non-conducting external coating not less than two inches in thickness.

(4) In the case of floors and of the roofs of projecting shops
(a) Brick, tile, porous terra-cotta or concrete composed as described in Paragraph (1) (3) of this Schedule, not less than five inches thick in combination with iron or steel.
(b) Plugging of concrete composed as described in the said Paragraph (1) (3) not less than five inches thick between wood joists provided a fillet one inch square is secured to the sides of the joists and placed so as to be in a central position in the depth of the concrete.

(5) In the case of verandahs, balustrades, outside landings, the treads, strings, and risers of outside stairs, outside steps, porticos and porches, oak, teak, jarrah karri or other hard timber not less than two inches thick.

(6) In the case of internal partitions enclosing staircases and passages, terra-cotta brickwork, concrete, or other incombustible material, not less than three inches thick, in between iron or steel or hard wooden uprights, not more than three feet apart, with sills and heads of channel-iron or hard wood, and with interstices not exceeding six feet apart, the ironwork to be not less than one and a half inches in diameter, and the hard wood not less than three inches in diameter, the whole of the wood or ironwork to be protected with plastering not less than three-fourths of an inch in thickness.

(7) In the case of glazing for windows, doors and borrowed lights, lantern or skylight glass, not less than one-fourth of an inch in thickness, in direct combination with metal, the melting point of which is not lower than 1,800 degrees Fahr., in squares not exceeding sixteen square inches, and in panels not exceeding two feet across either way, the panels to be secured with fire-resisting materials in fire-resisting frames of hard wood, not less than one and three quarters of an inch finished thickness, or in hard metal.

(III) Any material from time to time approved by the Council as fire-resisting.

NOTE.—Flame-proof wood, is wood so impregnated throughout that splinters taken from any portion will not carry flame.

SUGGESTION II. *re* DOORS.

Our Executive consider that revolving doors or shutters should be permissible if properly constructed. In practice it is more likely that they will be regularly closed when the work in premises ceases than heavy iron hung or sliding doors. They are economical in the space they occupy and thus meet the objections of many property owners to heavy iron doors. Besides this, they are more effective if properly constructed than the iron doors as proposed in the Bill. Report No. 25 is enclosed, and Report No. 100 on tests with such revolving doors or shutters is enclosed.

Our Executive again point to the question of fastenings to iron doors and enclose Report No. 60.

They also suggest that stone and iron lintels should no longer be permissible.

The proposed alterations to the Bill read as follows :—

Page 55. Section 77 (*b*). Omit the words "stone or iron" and add "concrete or reinforced concrete." Substitute "one-half of an inch" on second line in place of "one-fourth." After the word "thick" at end of second line add "and not less than one-quarter of an inch thick in the panel." After the word "panel," add "and the styles and rails at least six inches wide, the doors to be." After the word "wall" on third line, omit the words "fitted to rebated frames," and add "and to be either hung on hinges or pivots and fitted close to rebated wrot iron frames and secured by bolts or other fastenings at the top middle and bottom of each style."

Page 56. Section 77 (*b*). After the word "shutters" substitute the word "similarly" for "properly." After the word "frames," first line, add "at least two inches in depth." After the words "doors and shutters shall be" on second line, omit the words "fitted with bolts or other fastenings and be." After the words "from either side and" on the third line, omit the words "shall have styles and rails at least six inches wide."

Page 56. Section 77 (*b*). Replace as follows after the word "wide" on fourth line :—

"Shall be constructed, fitted, and maintained in an efficient condition in all respects to the satisfaction of the District Surveyor. Provided that in lieu of such doors and shutters as above described, such openings may be fitted with revolving vertical shutters, to run in iron or steel guides, two inches deep ; such guides to be securely bolted to the jambs, and constructed so as to allow of both lateral and vertical expansion and contraction. The revolving shutters to be formed with steel not less than one-sixteenth of an inch thick. and so constructed and connected as to prevent the passage of flame, and also to allow for contraction and expansion."

SUGGESTION III. Shutters to Windows.

Our Executive hold that the Bill which provides for shutters to window openings should sanction revolving steel and iron shutters. These are more reliable than the armoured shutters specified, and have the same advantages as the revolving shutters for door openings described above.

My Executive suggest :—

Page 71. Section 106 (*2*). Omit the word "solid" in third line, and add after "iron"—

"or revolving steel or iron."

SUGGESTION IV. Opposing Windows.

Our Executive hold that the provisions in the Bill relating to windows in external walls of buildings of the warehouse class should be amended so as to include for opposing windows in thoroughfares of 30 ft. in width, and that the figure in the Bill should thus be 31 ft. And, further, they respectfully suggest that a different wording might make this proposed clause more easily understandable to the average building owner and builder.

Our Executive suggest :—

Page 70. Section 106 (*1*). Omit this clause and replace by :—

"In every new building of the warehouse class, and all other new buildings used, or to be used, for purposes of trade, which have windows abutting upon a street under 31 feet in width, and all windows in such building abutting upon any light court, area, well within a distance of 31 feet from any opposite wall containing windows, or being the property of an adjoining owner or owners, shall be fitted either with metal frames glazed with fire-resisting glazing, or fitted with fire-resisting shutters capable of being closed and fastened from the inside."

SUGGESTION V. *re* ROOFS OF BUILDINGS OF THE WAREHOUSE CLASS.

Our Executive consider that the provisions as to the construction of roofs of buildings of the warehouse class, as also for those buildings used for purposes of trade or manufacture, should be constructed of fire-resisting materials, except for the necessary woodwork in doors and window frames.

Our Executive suggest :—

Page 45. Section 61 (*3*). That this paragraph read as follows :—

"The roofs, flats and gutters of a building of the warehouse class, and all other buildings used, or to be used, for purposes of trade or manufacture, and every turret, dormer, or other erection thereon, shall be constructed solid of fire resisting materials, except the necessary woodwork of doors and frames, windows and frames, skylights and lantern lights."

Our Executive urge that the points they have previously raised, and now further raise, have your attention, and they have, as indicated above, embodied both their former and present suggestions in the enclosed annotated copy of the Bill.

WE ARE, DEAR SIR,

YOURS VERY TRULY,

On behalf of the Executive of the BRITISH FIRE PREVENTION COMMITTEE.

EDWIN O. SACHS,
Chairman.

ELLIS MARSLAND,
General Hon. Secretary.

PS. Should it really be the intention of the Council to allow the great cubical extent for individual floors as provided by the Bill which our Executive commented on before as eminently dangerous (See Jan. 27th, 1905) we are to suggest that the danger of fire spreading from floor to floor through windows above one another, be modified, by the requirements of window shutters being enforced as for opposing windows, Sec. 106 (*2*) such section being altered as above.

365279

"RED BOOKS" OF THE
BRITISH FIRE PREVENTION COMMITTEE.—No. 121.
Edited by the Executive.

FIRE TESTS
WITH
FIRE EXTINGUISHERS.

FIRE EXTINGUISHERS

Known as the "Minimax" Extinguishers,

SUBMITTED FOR TEST BY

MESSRS. "MINIMAX," LIMITED,

LONDON.

The Committee's Report.

LONDON, 1907.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE,
(Founded 1897—Incorporated 1899).
1, WATERLOO PLACE, PALL MALL.

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1, WATERLOO PLACE, PALL MALL

Two Shillings and Sixpence.

365279

OBJECTS OF THE COMMITTEE.

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts, and translations.

To undertake such independent investigations and tests of materials, methods, and appliances as may be considered advisable.

The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.

The Committee is not responsible for the views of individual authors as expressed in Papers or Notes, but only for such observations as are formally issued on behalf of the Executive.

COUNCIL.

Chairman of the Executive:

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SIR JOHN TAYLOR, K.C.B., Consulting Architect, H.M. Office of Works.
ROBERT VIGERS, Past President the Surveyors' Institution.
ARTHUR WHITELEGGE, C.B., M.D., Chief Inspector of Factories, Home Office.
SIR JAMES WILLIAMSON, C.B., late Director of H.M. Dockyards.
SIR HENRY TRUEMAN WOOD, M.A., Secretary, Society of Arts.

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JAMES SHEPPARD, A.Inst.E.E., Surveyor North British and Merc. Ins. Co.;
OSWALD C. WYLSON, F.R.I.B.A.

Gen. Hon. Secretary:

ELLIS MARSLAND, District Surveyor.

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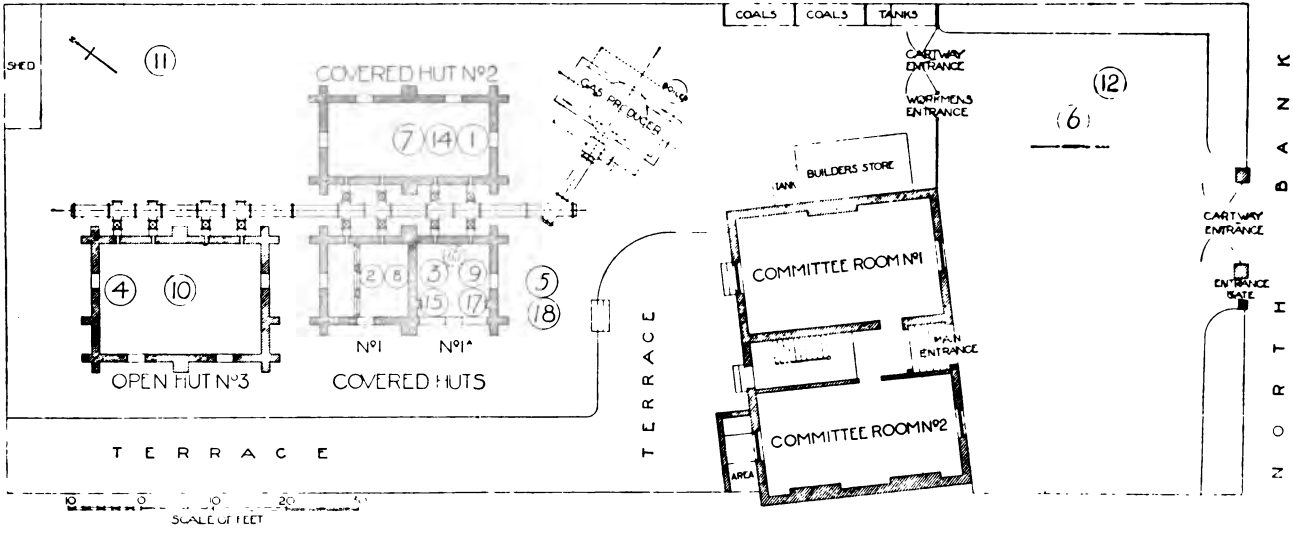

FIG. 1. LOCATION OF THE VARIOUS TESTS. (RE-TESTS WERE LOCATED THE SAME AS THE TESTS.)

NOTE.

Although there are various opinions as to the usefulness of chemical first-aid appliances, those tests arranged by the Committee, proved that this particular extinguisher, when applied within a short time of the outbreak of a small fire, could be used to great advantage either in putting it out or holding it in check.

There was, however, the usual difficulty in dealing with soft and loose material.

Chemical first-aid appliances should be examined and tested periodically.

PERCY COLLINS.

LONDON,
August, 1907.

FIG. *A*. TEST NO. 1. (*View before Test.*)

FIG. *B*. TEST NO. 1. (*View after Test.*)

OFFICIAL REPORTS

OF THE

British Fire Prevention Committee

[FOUNDED 1897—INCORPORATED 1899].

FIRE TEST No. 90.—FEB. 27TH AND MAY 1ST, 1907.

FIRE EXTINGUISHERS

Known as the "MINIMAX" Extinguishers

SUBMITTED FOR TEST BY

MESSRS. MINIMAX, LIMITED,
LONDON.

OBJECT OF TESTS.

To ascertain the effect of the application of "Minimax" Fire Extinguisher, supplied by the testor, upon various burning materials both in a confined room and in the open.

Note.—The tests comprised both tests ordered by the Committee and tests undertaken at the request of the testor.

In certain instances the tests were followed by *Re-tests*, either ordered by the Committee or undertaken at the request of the testor.

Note.—Of the tests undertaken at the request of the testor, those marked with an asterisk (*) were "demonstration" tests, whereby a great blaze of flame is obtained from liquids of a volatile character, the fire generally having little body.

TESTS APPLIED.

The following were the tests applied :—

TEST No. 1.—This was undertaken to show the effect of the extinguisher upon a fire which was started at a dressing table in a bedroom, with curtains, etc., above, the dressing table being draped with loose material and having inflammable dressing utensils lying thereon.

TEST No. 2.—This was undertaken to show the effect of the extinguisher upon hay in a raised wooden rack in a stable.

Re-test No. 2A.—This was a re-test of No. 2, at the request of the testor.

NOTE.—Permission was accorded to the operator to use a rake as well as the extinguisher.

TEST No. 3.—This was undertaken to show the effect of the extinguisher upon a burning crate of loose wood-wool such as might be found in a packing room of a wholesale or retail store.

Re-test No. 3A.—This was a re-test of No. 3, by request of the testor.

*†TEST No. 4.—This test was undertaken at the request of the testor to show the effect of the extinguisher upon a stack of 12 tarred packing cases, stacked against a wall, open face outwards, and each containing a small quantity of inflammable material such as would be used for packing, the whole being sprinkled with spirit.

†*Re-test No.* 4A.—This was a re-test of No. 4, by order of the Committee, the packing cases not being tarred and no spirits being used.

*TEST No. 5.—This was undertaken at the request of the testor to note the effect of the extinguisher upon a pyramidical stack of creosoted wood, with some loose wood-wool at the bottom so placed as to create a blaze, the whole being sprinkled with spirit.

†*Re-test No.* 5A.—This was a re-test of No. 5, by order of the Committee, the wood not being creosoted and no spirit being used.

*†TEST No. 6.—This was undertaken, at the request of the testor, to note the effect of the extinguisher upon burning wood laths resting against a screen and sprinkled with spirit.

†*Re-test No.* 6A.—This was a re-test of No. 6, by order of the Committee.

Re-test No. 6B.—This was a re-test of No. 6, by order of the Committee.

†*Re-test No.* 6C.—This was a re-test of No. 6, by order of the Committee, with the laths closely stacked and supplemented by wood-wool (Test No. 6B, having been recorded as a "No" test).

†TEST No. 7.—This was undertaken to show the effect of the extinguisher upon a burning heap of shavings and small pieces of soft wood.

†TEST No. 8.—This was undertaken to show the effect of the extinguisher upon a burning heap of straw and small pieces of soft wood, slightly damped with water.

†TEST No. 9.—This was undertaken to ascertain the effect of the extinguisher upon burning celluloid.

†*Re-test No.* 9A.—This was a re-test of Test No. 9, by order of the Committee.

*TEST No. 10.—This was undertaken, at the request of the testor, to note the effect of the extinguisher upon burning logs, with laths, wood-wool and spirit.

†*Re-test No.* 10A.—~~This was~~ a re-test of No. 10, by order of the Committee, no spirit being used.

*TEST No. 11.—This was undertaken, at the request of the testor, to show the effect of the extinguisher when applied upon laths in a confined space (shelter) and sprinkled with spirit.

TEST No. 12.—This was undertaken to show the effect of the extinguisher upon burning petrol vapour.

†*Re-test No.* 12A.—This was a re-test of No. 12 (Test No. 12 having been recorded as a " No " test).

TEST No. 14.—This was undertaken to show the effect of the extinguisher upon a burning heap of loose rubbish composed of wood-wool, shavings, hay, straw, wastepaper and cotton rags.

TEST No. 15.—This was undertaken to show the effect of the extinguisher upon burning heaps of oily rags and dirty cotton waste.

TEST No. 16.—This was undertaken to show the effect of the extinguisher upon a bonfire composed of hay, straw, wood-wool and shavings when in an exposed position.

†TEST No. 17.—This was undertaken to show the effect of the extinguisher upon a series of burning heaps of oily rags and dirty cotton waste.

*TEST No. 18.—This was undertaken, at the request of the testor, to show the effect of the extinguisher upon a burning " lake " of tar, which had been sprinkled with spirit.

Re-test No. 18A.—This was a re-test of No. 18, by order of the Committee, no spirit being used.

Note.—In the tests marked with a † (Nos. 4, 4A, 5A, 6, 6A, 6C, 7, 8, 9, 9A, 10A, 12A, 17), the extinguishers were applied by nominees of the Committee, who were selected promiscuously from amongst members, visitors and staff, and who were requested to apply the extinguishers to the best of their ability. In all other tests, the extinguishers were applied by the nominees of the testor, who were thoroughly conversant with the use of the appliances and had had experience of previous demonstration tests.

SUMMARY OF THE TESTS.

The following is a summary of the results of the tests :—

The tests demonstrated that the extinguishers brought into action were uniformly efficient in checking a small fire in its early stages, whether applied by parties inexperienced in their use or by parties having expert knowledge of their application (*i.e.*, by nominees of the Committee or nominees of the testor).

In several instances one appliance sufficed to completely extinguish a small fire.

Where the material ignited was soft and loose, great

difficulty was apparent in stopping the smouldering which ensued, the flames, however, being held in check.

No difficulty was experienced (with two exceptions) in putting the appliances into action. In one case a nominee of the Committee failed to get an extinguisher to work, and in another an extinguisher did not operate as intended. Both these extinguishers had been charged on February 27th and were used at the re-tests of May 1st, 1907.

NOTE.—The testor stated that in the one instance referred to as an exception (Test No. 4A), the operator did not use sufficient force to start the extinguisher efficiently, and that in the second instance (Test No. 6c) the nozzle of the extinguisher was choked by some foreign substance.

Note.—The following table summarises the number of extinguishers used, time occupied in their application, distance at which they were operated, and the effect noted, the tests marked with the affix A, B, or C being re-tests:—

Test or Re-test.	Extinguishers. □Large. *Small. (B)	(A)	Time occupied.	Distance of Operator. at first.	at end.	Remarks.
			min. secs.			
No. 1	—	1	1 29	12 ft.	(3·657 *m.*)	Fire out.
„ 2	1	1	1 50	11 ft.(3·353 *m.*)	at close qtrs.	Fire checked (it burnt up again and was allowed to burn itself out.)
„ 2A	2	—	6 35	at close	quarters.	Fire out.
„ 3	—	1	1 30	6 ft.(1·828 *m.*)	at close qtrs.	Fire checked and nearly extinguished (it was allowed to burn itself out.)
„ 3A	1	—	4 22	at close	quarters	Fire out.
„ 4	1	—	1 46	15 ft.(4·572 *m.*)	at close qtrs.	Fire out.
„ 4A	2	—	4 47	15 ft.(4·572 *m.*)	6 ft. (1·828 *m.*)	Fire checked (it was put out with 4 pails of water.)
„ 5	1	—	0 40	at close	quarters.	Fire out.
„ 5A	1	—	1 40	9 ft.	(2·743 *m.*)	Fire out.
„ 6	—	1	0 35	12 ft.	(3·657 *m.*)	Fire out.
„ 6A	—	1	0 31	9 ft.	(2·743 *m.*)	Fire out.
„ 6B	no	test	—	—	—	—
„ 6C	—	1	1 10	at close	quarters	Fire out.
„ 7	—	1	0 50	at close	quarters.	Fire checked (it burnt up again and was stamped out.)
„ 8	—	2	3 0	at close	quarters	Fire checked (it was eventually put out by a can of water.)
„ 9	—	1	0 33	6 ft.	(1·828 *m.*)	Fire out.
„ 9A	—	1	0 28	6 ft.	(1·828 *m.*)	Fire out.
„ 10	1	—	1 35	at close	quarters	Fire out.
„ 10A	2	—	4 0	9 ft.	(2·743 *m.*)	Fire out.
„ 11	—	1	1 30	6 ft.	(1·828 *m.*)	Fire out.
„ 12	no	test.	—	—	—	—
„ 12A	—	1	1 23	9 ft.(2·743 *m.*)	at close qtrs.	Fire out.
„ 14	1	2	9 30	6 ft.	(1·828 *m.*)	Fire checked (it was eventually stamped out.)
„ 15	—	1	1 5	4 ft. 6 in.	at close qtrs.	Fire checked (one of the heaps burst into flame again and was stamped out.)
„ 16	1	2	5 30	13 ft.(3·962 *m.*)	at close qtrs.	Fire checked (it was eventually raked over and stamped out.)
„ 17	—	2	3 0	6 ft.(1·828 *m.*)	at close qtrs.	Fire out.
„ 18	—	1	0 31	12 ft.	(3·657 *m.*)	Fire out.
„ 18A	—	1	1 27	12 ft.	(3·657 *m.*)	Fire out.

□ Large extinguishers contain 10 pt. (5·679 litres).
* Small extinguishers contain 16 pt. (9·087 litres).

NOTE.—Tests marked with the affix A, B, or C were re-tests.

SPECIAL RULES FOR THE CONDUCT OF TESTS WITH EXTINGUISHERS.

The following rules were laid down by the Executive and served as a guide for the tests of February 27th and May 1st, 1907 :—

The tests will generally be taken in numerical order, subject to alteration by the directing member.

Tests will, where considered advisable by the Sub-Committee, be repeated at their discretion (known as Re-tests).

The extinguisher will be applied at the desire of the Sub-Committee either by a member of the Committee or the testor, or by a nominee of either.

The Committee provide material for certain tests as may be directed by the Sub-Committee and the testor for the others, but the Sub-Committee may replace the material provided by the testor by their own, or use their own at re-tests.

The fire having been allowed to progress at the discretion of the directing member, the extinguisher will be applied from a position and at a distance pointed out by him, a time limit being set to each test at his discretion.

Directly the number of extinguishers specified have been used or the time limit has been reached, a whistle will be sounded and the test stopped, and any fire remaining will be extinguished otherwise than by extinguishers.

Directly a fire has been extinguished by an extinguisher, a whistle will be sounded and test stopped.

The party extinguishing a fire must not touch the material under test except with the liquid from extinguisher, unless by direction of the directing member.

The contents of any extinguisher on the ground may be reserved for analysis, and any extinguisher or extinguishers reserved for examination.

The arrangements are subject to alteration by the directing member.

DESCRIPTION OF TESTING PLANT.

The tests were conducted at the Committee's Testing Station at North Bank, Regent's Park.

Of the tests (with their respective re-tests), Nos. 5, 6, 11, 12, 16 and 18 were undertaken in the open, and tests Nos. 1, 2, 3, 4, 7, 8, 9, 10, 14, 15, 17 in the testing chambers of the Committee.

Testing Chambers Nos. 1, 1A, 2 and 3 were used.

Tests Nos. 2, 2A and 8 were undertaken in Hut No. 1 ; tests Nos. 3, 3A, 9, 15 and 17 in Hut No. 1A ; tests Nos. 1, 7, and 14

in Hut No. 2; and tests Nos. 4, 4A and 10 in Hut No. 3. Of the tests in the open, test No. 16 was taken on the top of Hut No. 1A.

Testing Chamber No. 1 was a covered hut measuring 10 ft. by 10 ft. by 8 ft. high (3·048 by 3·048 by 2·438 *m.*). Testing Chamber No. 1A was a covered hut with its front open and measured 10 ft by 10 ft. by 8 ft. 11 in. high (3·048 by 3·048 by (2·717 *m.*). Testing Chamber No. 2 was a covered hut measuring 22 ft. 3 in. by 10 ft. by 8 ft. 3 in. high (6·781 by 3·048 by 2·514 *m.*). Testing Chamber No. 3 was an open hut, *i.e.*, a hut without roof, measuring 22 ft. 3 in. by 15 ft. floor surface (6·781 by 4·572 *m.*).

Some of the materials for the tests were partially provided by the testor and by the Committee, and were of the ordinary description.

PREPARATION FOR AND CONDUCT OF THE TESTS.

The tests were undertaken on February 27th and on May 1st, 1907.

The tests and re-tests undertaken on February 27th were as follows:—Nos. 1, 2, 3, 4, 5, 6, 6A, 7, 8, 9, 9A, 10, 11, 12, 14, 15, 16, 17, 18.

They were commenced at 1.30 p.m. and were completed by 7.30 p.m.

The re-tests undertaken on May 1st, 1907, were as follows:—Nos. 2A, 3A, 4A, 5A, 6B, 6C, 10A, 12A, 18A.

They commenced at 11 a.m. and were completed by 1 p.m.

At 3 p. m. on February 27th the meteorological observations taken at the Royal Botanic Gardens, Regent's Park, read as follows: State of weather, cloudy; wind, N.E.; barometer, 30·50 in. (0·775 *m.*); attached thermometer, 58° Fahr. (14·4 *C.*); dry bulb, 48° Fahr. (8·8 *C.*). Wet bulb 43° Fahr. (6·1 *C.*). Remarks: fine afternoon, misty.

At 9 a.m. on May 1st they read as follows: State of weather, cloudy; wind, N.W.; barometer, 29·80 in. (0·762 *m.*); dry bulb, 40.5° Fahr. (4·7° *C*); wet bulb, 39° Fahr. (3·8 *C.*). Remarks: Dull cold morning.

All the extinguishers used were provided and charged by the testor. Those used on February 27th were charged on that day or the day previously. The majority of those used on May 1st had been charged on February 26th and 27th.

The appliances to be used for each individual test were placed in special holders or brackets provided by the testor.

The Directing Member of the Sub-Committee decided *ad hoc* immediately before the commencement of each test or re-test, whether a nominee of the testor or of the Committee should operate the appliances. The nominees of the testor were in every case members of his permanent staff; the nominees of the Committee were either members or officials of the Committee or visitors.

DESCRIPTION OF APPLIANCE

(Taken from the Maker's description.)

"The apparatus consists of a vessel, conical in shape, made of sheet steel and coated with lead, down the inner side of which, and thus forming the only connection between the interior and exterior, there is an exit tube for the purpose of conveying the jet through the aperture in the nozzle. This aperture is drilled slightly diagonally for the purpose of enabling the person operating the apparatus to obtain the correct elevation of the jet. The apparatus is filled with bicarbonate of soda in solution.

In the centre of the base of the cone there is an orifice admitting a perforated metal cage, into which is inserted a glass tube, hermetically sealed by fusion, containing acid.

A plunger is screwed on to the base of the cone. In case of fire the operator must take the apparatus and strike the plunger on the floor or against the wall.

The blow thus given to the plunger shatters the glass tube and chemical action takes place, the acid uniting with the bicarbonate of soda and generating gas which exerts a pressure of about three atmospheres on the fluid and expels it from the apparatus by way of the exit tube and nozzle. The apparatus itself, however, the maker states, is tested to withstand a pressure of fifteen atmospheres.

Fig. 2.

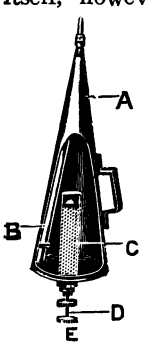

Fig. 3.

A device attached to the exit tube in the inner part will prevent any of the contents being forced out of the nozzle by expansion of air inside the apparatus caused by rise of temperature, during the time it is hanging ready for use.

The ordinary "Minimax" designed for domestic and factory use, is not fitted with a tap. Should it be desirable for any reason to stop the flow of

*A = Exit Tube. B = Perforated Metal Cage. C = Plunger Rod. E = Plunger Head.

the jet, this can be easily accomplished by placing the first finger over the aperture in the nozzle.

NOTE.—In the apparatus designed for special purposes, viz. :—the "Fire brigade Minimax" and the "Auto-minimax," the maker states a 3-ways tap is provided and also a safety valve which blows off at a pressure of 10 atmospheres.

The testor states that the following models were under test :

Model "A" (for general use) containing 10 pints :

Weight, unfilled	.. .. ..	7½ lbs. (3·402 *k.*)
Weight, filled	.. .. ..	21 „ (9·525 *k.*)
Measurement	.. .. ..	29½ in. (0·739 *m.*)

This model is made of sheet steel, coated with lead.

Weight, unfilled	.. .. ..	5 lbs. (2·268 *k.*)
Weight, filled	.. .. ..	19 „ (8·618 *k.*)

Model "B" (for factories, dockyards, etc.), containing two gallons :

Weight, unfilled	.. .. ..	9½ lbs. (4·309 *k.*)
Weight, filled	.. .. ..	29 „ (13·154 *k.*)
Measurements	.. .. ..	34¾ in. (0·876 *m.*)

This model is made of sheet steel, coated with lead.

Weight, unfilled	.. .. ..	9 lbs. (4·083 *k.*)
Weight, filled	.. .. ..	28½ „ (12·927 *k.*)

The charge in all cases consisted of bicarbonate of soda and hydrochloric acid.

EXAMINATION OF THE APPLIANCE.

The following extinguishers were tested for range and duration of action on May 29th, 1907 :—

A small extinguisher (charged on February 27th) : range of action 23 to 32ft. (0·584 *m.* to 0·813 *m.*). Spray began to diminish in 45 secs. At 1 min. 26 secs. spray was only 20ft. (0·508 *m.*). Exhausted in 1 min. 40 secs.

A small extinguisher (charged on day of test) : range of action 25ft. to 35ft. (0·635 *m.* to 0·889 *m.*). Spray began to diminish in 28 secs. At 28 secs. spray was 30ft. (0·762 *m.*), at 32 secs. it was 20ft. (0·508 *m.*). Exhausted in 1 min. 6 secs.

A large extinguisher (charged on February 27th) : range of action 18ft. to 31ft. (0·457 *m.* to 0·787 *m.*). Exceptional spurt to extreme distance of 35ft. (0·889 *m.*). Spray began to diminish in 30 secs. At 35 secs, it was 25 ft. only (0·635 *m.*) Exhausted in 1 min. 15 secs.

A large extinguisher (charged on day of test) : range of action 20ft. to 32ft. (0·508 *m.* to 0·813 *m.*). Exceptional spurt to extreme distance of 37ft. (0·939 *m.*). Spray began to diminish in 52 secs. At 60 secs. it was 30ft. only (0·762 *m.*). Exhausted in 1 min. 30 secs.

THE OBJECT OF, CONDITIONS, AND ARRANGEMENTS FOR, THE TESTS, WITH THE LOG OF EACH TEST.

TEST No. 1.

Object of Test No. 1.—This test was undertaken to note the effect of the extinguisher upon a fire which was started at a dressing-table in a bedroom with curtains, etc., above the dressing-table being draped with loose material and having inflammable dressing utensils lying thereon.

Arrangements for Test No. 1.—Against the south wall of the Hut No. 2 was placed a small deal-top table which had a covering and vallance of figured muslin. On the table were celluloid combs, hand glasses and boxes. On the right of the table was a cane-seated chair, and on the left a similar chair and a waste paper basket containing waste paper. Above the table was placed a wooden cornice with vallance and pole, over which were hung two pairs of lace curtains with two paper fly-catchers. The wall at the back of the table and the two side walls for some few feet down were papered. (*See Fig. A.*)

Log of Test No. 1.—The waste paper in the basket was lighted, and the fire was allowed to burn for 41 secs.

The flames obtained a fair hold of the materials.

One small extinguisher was applied by a nominee of the testor, who stood 12 ft. (3·657 *m.*) away.

The extinguisher was applied for 1 min. 29 secs., and was exhausted.

The fire was wholly extinguished.

The curtains, fly-papers, and some of the ornaments were wholly consumed, and a good deal of the wall paper was burnt. (*See Fig. B.*)

TEST No. 2.

Object of Test No. 2.—This test was undertaken to show the effect of the extinguisher upon hay in a raised wooden rack in a stable.

Arrangements for Test No. 2.—Opposite the door in west side of Hut No. 1 was placed a wooden erection to represent a hay rack in a stable. This rack was composed of light strips of wood fixed 3 ft. 4 ins. (0·483 *m.*) above the floor. It was 5 ft. (1·524 *m.*) long, 2 ft. 6 in. (0·762 *m.*) deep, and 3 ft. (0·914 *m.*) from back to front. The back and one end were formed by the brickwork of the hut; the front, bottom, and one end of wood strips. Half a truss of hay was placed loosely in the rack. (*See Fig. C.*)

Log of Test No. 2.—The hay was lighted at 1 point and allowed to burn for 1 min.

The flames obtained a good hold of the hay.

One large and one small extinguisher were applied by a nominee of the testor, who stood at first 11 ft. (3·353 *m.*) away, but after

1 min. 13 secs. he went inside the hut and worked intermittently at close quarters.

In 1 min. 50 secs. the first extinguisher was exhausted.

The flames were held in check and at times apparently extinguished, but smouldering continued and fire broke out again, and was allowed to burn itself out.

RE-TEST No. 2A.

Object of Re-test No. 2A. (At the request of the testor.)—This test was undertaken to show the effect of the extinguisher upon hay in a raised wooden rack in a stable. (Permission being accorded to use a rake.)

Arrangements for Re-test No. 2A.—The arrangements were practically identical as for Test No. 2, with the exception that the material comprised a mixture of hay and straw.

Log of Re-test No. 2A.—The fire was lighted at one point and allowed to burn for 1 min. 15 secs.

NOTE.—This was 15 seconds longer than in Test No. 2.

The flames obtained a fair hold upon the hay.

Two large extinguishers were used by a nominee of the testor working at close quarters with the aid of an assistant. He also had at his disposal a rake.

The extinguishers were intermittently in action.

The fire was extinguished in 6 mins. 35 secs.

The extinguishers were exhausted. About half of the hay was consumed.

TEST No. 3.

Object of Test No. 3.—This test was undertaken to show the effect of the extinguisher upon a burning crate of loose wood-wool, such as might be found in a packing room of a wholesale or retail store.

Arrangements for Test No. 3.—A lightly made crate, composed of strips of wood and measuring 4 ft. by 3 ft. by 2 ft. (1·219 *m.* by 0·914 *m.* by 0·609 *m.*) deep, was loosely filled with wood-wool. The crate was raised about 1 ft. (0·305 *m.*) from the floor of Hut No. 1*a*, being stood on two concrete blocks. (*See Fig. D.*)

Log of Test No. 3.—The fire was lighted in two places and allowed to burn for 40 secs.

The flames had obtained complete hold of the wood-wool fired, and had slightly charred the crate.

One small extinguisher was applied by a nominee of the testor, who stood 6 ft. (1·828 *m.*) away for 1 min., and thereupon worked at close quarters.

The extinguisher was exhausted in 1 min. 30 secs.

The fire was checked and nearly extinguished.

The remains of the fire were allowed to burn themselves out.

RE-TEST No. 3A.

Object of Re-test No. 3A. (At the request of the testor.)—This test was undertaken to show the effect of the extinguisher

FIG. C. TEST NO. 2. (*View before Test.*)

FIG. D. TEST NO. 3. (*View before Test*).

upon a burning crate of loose wood-wool, such as might be found in a packing room of a wholesale or retail store.

Arrangements for Re-test No. 3A.—The arrangements were practically identical with those for No. 3, but some additional wood-wool was put into the crate during the testing operation, 6 bushels of wood-wool in all being used.

Log of Re-test No. 3A.—The fire was lighted at one point and allowed to burn for 1 min. 40 secs.

NOTE.—This was 60 seconds longer than in Test No. 3.

The fire had obtained a good hold of the wood-wool.

One large extinguisher was used by a nominee of the testor and employed intermittently at close quarters.

The fire was extinguished in 4 mins. 22 secs.

The extinguisher was exhausted.

The wood-wool was practically consumed and the inside of the crate charred.

TEST No. 4.

(*Testor's Demonstration Test.*)

Object of Test No. 4.—This test was undertaken, at the request of the testor, to show the effect of the extinguisher upon a stack of 12 packing cases, stacked against a wall, open face outwards and each containing a small quantity of inflammable materials, such as would be used for packing.

Arrangement of Chamber for Test No. 4.—Twelve wooden cases each measuring about 3 ft. (0·914 *m.*) square were piled up against the north wall of Hut No. 3, facing south. Some small pieces of laths and a little wood-wool was strewn about inside the cases. The inside of each box had been tarred by the testor and tar was sprinkled over the contents. In addition to this the whole had been well sprinkled with spirit by the testor, shortly before the test was undertaken. (*See Fig. E.*)

Log of Test No. 4.—The fire was lighted in four places and allowed to burn for 40 secs.

The flames obtained no practical hold upon the cases.

One large extinguisher was operated by a nominee of the Committee who stood at first 15 ft. (4·572 *m.*) away and afterwards at close quarters.

The extinguisher was exhausted in 1 min. 46 secs.

The fire was extinguished.

The insides of the cases were slightly charred. (*See Fig. F.*)

RE-TEST No. 4A.

Object of Re-test No. 4A. (By order of the Committee.)—This test was undertaken to show the effect of the extinguisher upon a stack of 12 packing cases, stacked against a wall, open face outwards and each containing a small quantity of inflammable

materials, such as would be used for packing, no tar nor spirit being used.

Arrangements for Re-test No. 4A.—The arrangements were

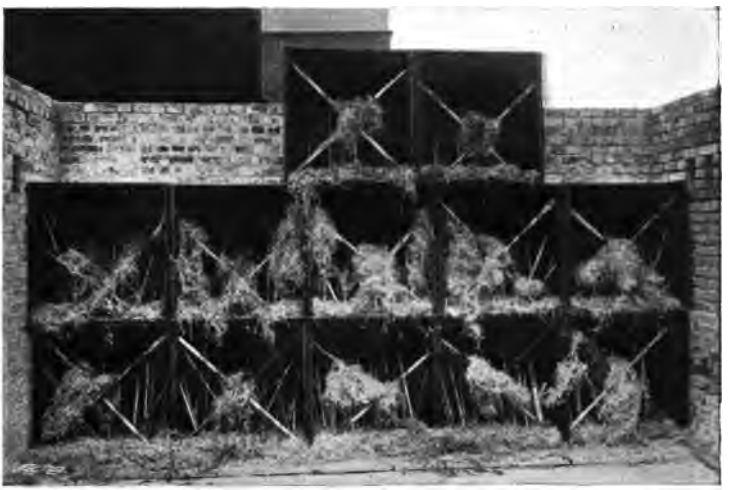

FIG. *E.* TEST NO. 4. (*View before Test.*)

FIG. *F.* TEST NO. 4. (*View after Test.*)

practically identical as for Test No. 4, excepting that no tar nor spirit were used.

Log of Re-test No. 4A.—The fire was lighted at several places and allowed to burn for 1 min. 5 secs.

NOTE.—This was 25 seconds longer than in Test No 4.

The flames obtained a fair hold of the inside of most of the cases.

One large extinguisher was started by a nominee of the Committee, but did not appear to operate efficiently, whereupon it was not applied but immediately exchanged for a fresh appliance.

NOTE.—The testor stated that the operator had not used sufficient force in starting this extinguisher.

Two large fire extinguishers were used by a nominee of the Committee first at 15 ft. (4·572 *m.*) away and then at 6 ft. (1.828 *m.*).

FIG. G. RE-TEST NO. 4A. (*View after Test.*)

The flames were practically subdued in 4 mins. 47 secs.

Both extinguishers were exhausted.

The shavings and loose materials in 7 of the 12 cases were consumed and the interior much charred.

In the remaining cases the loose material was partly consumed and the interior of the cases slightly charred. (*See Fig. G.*)

The remnants of the fire were extinguished with four pails of water.

TEST No. 5.

(*Testor's Demonstration Test.*)

Object of Test No. 5.—This test was undertaken, at the request of the testor, to note the effect of the extinguisher upon a pyramidical stack of creosoted wood with some loose wood-wool

at the bottom and the whole being sprinkled with spirit so as to create a blaze.

Arrangements for Test No. 5.—A pyramidical stack of tarred wood was erected in the open, about 12 ft. (3·657 *m.*) high, with some small pieces of wood, laths, and wood-wool scattered about. The whole was well sprinkled by the testor with tar and spirit preparatory to the test. (*See Fig. H.*)

(*View before Test.*)

(*View after Test.*)

FIGS. *H* AND *I.* TEST NO. 5.

Log of Test No. 5.—The fire was lighted at two points and allowed to progress for 1 min. 30 secs.

The flames obtained no practical hold upon the wood.

One *large* extinguisher was used by a nominee of the testor, who applied it at close quarters all round the pyramid.

The fire was extinguished in 40 secs.

The extinguisher was not exhausted.

All wood-wool and loose material was consumed and the creosoted wood slightly charred. (*See Fig. I.*)

RE-TEST No. 5A.

Object of Re-test No. 5A. (By order of the Committee.)—This test was undertaken to note the effect of the extinguisher upon a pyramidical stack of wood with some loose wood-wool at the bottom.

Arrangements for Re-test No. 5A.—The arrangements were practically identical as for Test No. 5, but the wood had not been creosoted, and no spirit was used.

Log of Re-test No. 5A.—The fire was lighted at two points and allowed to progress for 2 mins. 15 secs.

NOTE.—This was 45 seconds longer than in Test No. 5.

The flames obtained a fair hold upon the wood.

One large extinguisher was used by a nominee of the Committee, who applied it from three sides at about 9 ft. (2·743 *m.*) distance.

The fire was extinguished in 1 min. 40 secs.

The extinguisher was exhausted.

Nearly all the wood-wool and loose material was consumed, and with the exception of a few pieces all the timber was substantially charred.

TESTS No. 6 AND RE-TEST No. 6A.

(*Testor's Demonstration Test.*)

Object of Test No. 6.—This was a test undertaken, at the request of the testor, to note the effect of the extinguisher upon burning wood laths, resting against a screen and sprinkled with spirit.

Arrangements for Test No. 6.—Laid slanting against a metal structure in the open, 9 ft. wide by 7 ft. high (2·743 *m.*) by 2·286 *m.*) were placed 50 8-ft. (2·438 *m.*) laths and 84 4-ft. (1·219 *m.*) laths. These were sprinkled with about two pints (1·136 litre) of spirit preparatory to the test. (*See Fig. J.*)

Log of Test No. 6.—The fire was lighted at one point and was allowed to progress for 20 secs.

The flames obtained no practical hold upon the laths.

One small extinguisher was applied by a nominee of the Committee standing 12 ft. (3·657 *m.*) away.

The fire was put out in 35 secs.

The extinguisher was not exhausted.

The upper part of the laths was slightly charred. (*See Fig K.*)

Arrangements for Re-test No. 6A.—The test was rearranged and re-started as for Test No. 6.

Log of Re-test No. 6A.—The one small extinguisher was operated by a nominee of the Committee, standing 9 ft. (2·743 *m.*) away.

The fire was put out in 31 secs.

The extinguisher was not exhausted.

The upper part of all laths was slightly charred

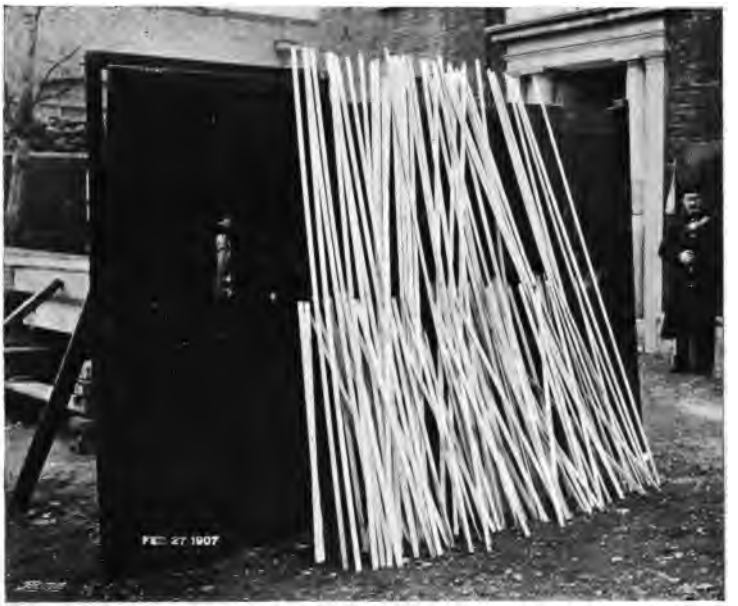

FIG. *J*. TEST NO. 6. (*View before Test.*)

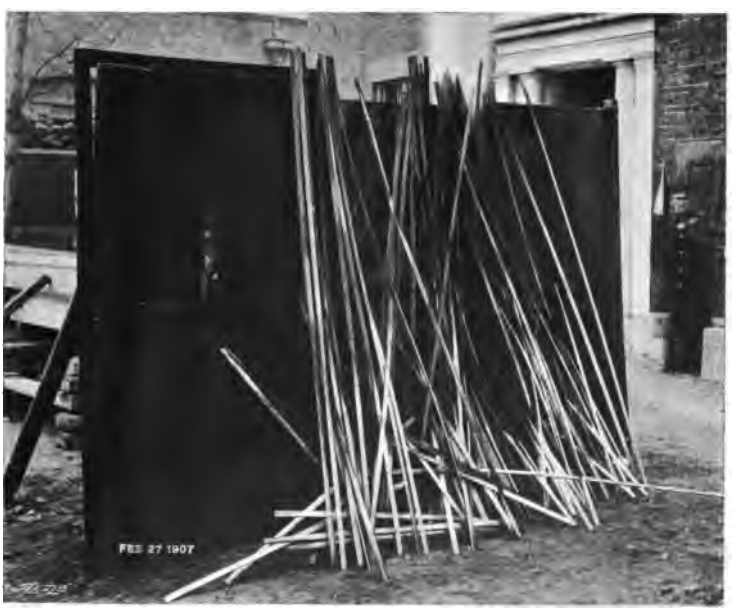

FIG. *K*. TEST NO. 6. (*View after Test.*)

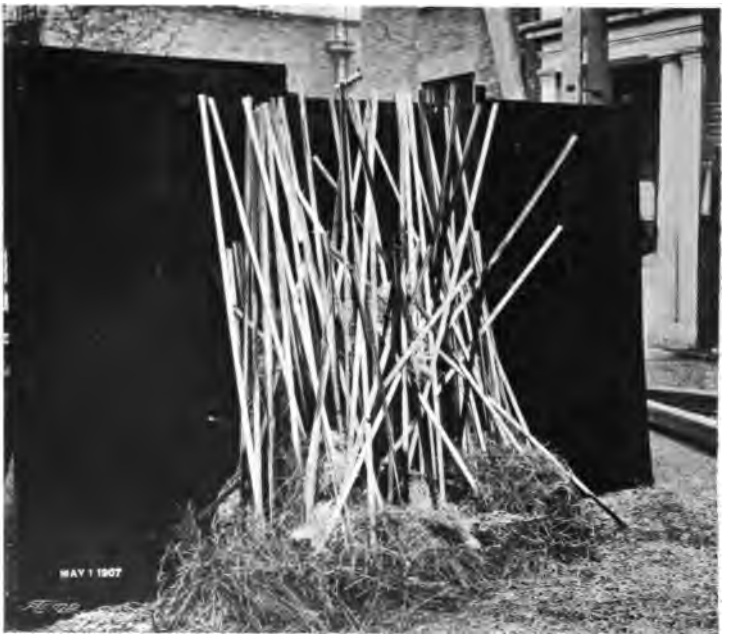

FIG. *L*. RE-TEST NO. 6C. (*View before Test.*)

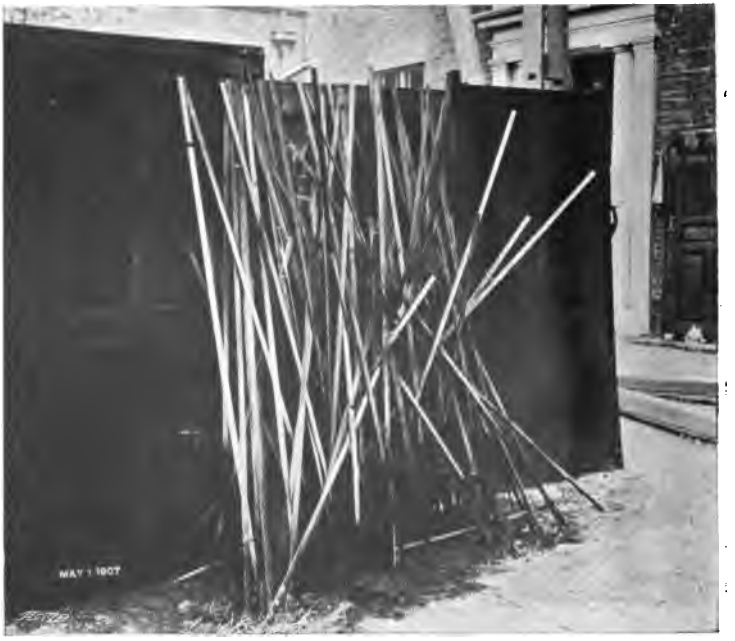

FIG. *M*. RE-TEST NO. 6C. (*View after Test.*)

RE-TESTS Nos. 6B and 6C.

(Testor's Demonstration Test.)

Object of Re-tests 6B *and* 6C. (By order of the Committee.)—These tests were undertaken to note the effect of the extinguisher upon burning wood laths resting against a screen and sprinkled with spirit.

Arrangements for Re-test No. 6B.—The arrangements were practically identical with those for Test No. 6, but 50 7-ft. (2·134 *m.*) and 50 4-ft. (*n.* 1·219 *m.*) laths were used and supplemented with two bushels of wood-wool, and about half a pint of spirit was sprayed on.

Log of Re-test No. 6B.—The fire was lighted at two points.

The fire was blown out by the wind within 1 min. 30 secs.

The test was ordered to be recorded as a "No test."

Arrangements for Re-test No. 6C.—The arrangements were practically identical with those for No. 6B, but a little hay was also used, about half a pint of spirit being employed, and the laths were stacked much closer together. (*See Fig. L and M.*)

Log of Re-test No. 6C.—The fire was lighted at two points and allowed to burn for 25 secs.

The fire obtained a fair hold of the laths.

One small extinguisher was started by a nominee of the Committee, but failed to work, and was thus not applied.

NOTE.—The testor stated that the nozzle of the extinguisher was choked by some foreign substance.

After 40 secs. a second small extinguisher was applied by the operator for 1 min. 10 secs.

The fire was extinguished in 1 min. 50 secs. (in all).

The extinguisher was not exhausted.

The loose material was consumed and the laths charred.

TEST No. 7.

Object of Test No. 7.—This test was undertaken to show the effect of the extinguisher upon a burning heap of shavings and small pieces of soft wood.

Arrangements for Test No. 7.—A bushel of small pieces of soft wood was mixed up with one sack of shavings loosely stacked on the floor of Hut No. 2. The heap was about 3 ft. (0·914 *m.*) across, and measured 1 ft. 3 in. (0·381 *m.*) high in the centre.

Log of Test No. 7.—The fire was lighted at one point and allowed to burn for 1 min. 15 secs.

The flames had obtained a complete hold of the shavings.

One small extinguisher was applied by a nominee of the Committee at close quarters.

In 50 secs. the fire was checked and almost extinguished,

but smouldering continued and the remnants burned up again and were eventually stamped out.

The extinguisher was not exhausted at the end of 50 secs., but was exhausted in the effort to subdue the smouldering remains.

TEST No. 8.

Object of Test No. 8.—This test was undertaken to show the effect of the extinguisher upon a burning heap of straw and small pieces of soft wood slightly damped with water.

Arrangements for Test No. 8.—A bushel of small pieces of soft wood was mixed with half a truss of straw and loosely stacked on floor of Hut No. 1, and one gallon of water sprinkled on same.

Log of Test No. 8.—The fire was lighted at one point and was allowed to progress for 1 min. 55 secs.

The flames obtained a good hold of the straw.

Two small extinguishers were applied by a nominee of the Committee for 3 mins. at close quarters.

The extinguishers were both exhausted.

The fire was checked and extinguished in part, but smouldering continued at the back, and the fire was eventually quenched by a can of water.

TEST No. 9 AND RE-TEST No. 9A.

Object of Test No. 9.—This test was undertaken to ascertain the effect of the extinguisher upon burning celluloid.

Arrangements for Test No. 9.—A heap of celluloid shavings and dust measuring about 2 ft. across by about 11 in. high (0·609 *m.* by ·279 *m.*) in the centre, was placed on the floor of the Hut No. 1A.

Log of Test No. 9.—The fire was lighted at one point and allowed to burn for 10 secs.

The flames immediately obtained a good hold of the celluloid.

One small extinguisher was applied by a nominee of the Committee standing 6 ft. (1·828 *m.*) away.

In 33 secs. practically the whole of the celluloid had been consumed.

The extinguisher was not exhausted.

Arrangement for Re-test No. 9A.—The arrangements were identical with those for Test No. 9.

Log of Re-test 9A.—The fire was lighted at one point and allowed to burn for 5 secs.

The flames immediately obtained a good hold of the celluloid.

One small extinguisher was applied by a nominee of the Committee standing 6 ft. (1·828 *m.*) away, and the fire was extinguished in 28 secs.

A small portion of the celluloid remained unburnt, but was quite saturated with the contents of the extinguisher.

The extinguisher was not exhausted.

TEST No. 10.

(Testor's Demonstration Test.)

Object of Test No. 10.—This test was undertaken at the request of the testor to note the effect of the extinguisher upon burning logs, with laths, wood-wool, and spirit.

Arrangement for Test No. 10.—Twenty logs of wood were placed in a pile in Hut No. 3. Laths were placed between the logs. The interior was filled with laths and wood-wool loosely packed and spirit was poured on. (*See Fig. N.*)

FIG. *N.* TEST NO. 10. (*View before Test.*)

Log of Test No. 10.—The fire was lighted in two places and allowed to burn for 2 mins. 30 secs.

The flames only attained a slight superficial hold.

One large extinguisher was applied by a nominee of the testor at very close quarters.

The fire was extinguished with one extinguisher in 1 min. 33 secs.

The extinguisher was exhausted.

All shavings were consumed and the laths partially consumed.

The logs were charred on the surface. (*See Fig. O.*)

FIG. *O.* TEST NO. 10. (*View after Test.*)

FIG. *P.* TEST NO. 10A. (*View after Test.*)

RE-TEST No. 10A.

Object of Re-Test No. 10A. (By order of the Committee)—This test was undertaken to note the effect of the extinguisher upon burning logs, with laths and wood-wool.

Arrangements for Re-test No. 10A.—The arrangements were practically identical with Test No. 10, but the logs were twenty-four in number and square in scantling, measuring 5 ft. by 3 in. by 4 in. (1·524 by ·076 by ·102 *m.*). No spirit was used, but the inside of the pile was well packed with wood-wool.

Log of Re-Test No. 10A.—The fire was lighted at two points and allowed to burn for 2 mins. 20 secs.

NOTE.—This was 10 seconds less than in Test No. 10.

The fire obtained a fair hold of the inside face of the logs.

Two large extinguishers were applied by a nominee of the Committee at first at 9 ft. (2·743 *m.*) distance and then at close quarters.

The fire was extinguished in 4 mins.

The second extinguisher was not exhausted.

The loose material was practically consumed, and the inside face of the logs deeply charred and the outside face slightly charred.

TEST No. 11.

(Testor's Demonstration Test.)

Object of Test No. 11.—This test was undertaken at the request of the testor to show the effect of the extinguisher when applied upon laths in a confined space (shelter) and sprinkled with spirit.

Arrangements for Test No. 11.—The shelter was arranged by the testor on lines often employed by manufacturers of extinguishers at public demonstrations. The lean-to wood shed was erected in the open and tarred inside, and contained a quantity of laths and loose wood and wood-wool, and the whole was well sprinkled with spirit. (*See Fig. Q.*)

Log of Test No. 11.—The fire was lighted in two places and allowed to burn for 30 secs.

The flames practically obtained no hold either of the laths or the shelter before the appliance came into action.

One small extinguisher was applied by a nominee of the testor, who stood at varying distances up to within 6 ft. (1·828 *m.*) of the shed.

The fire was extinguished in 1 min. 30 secs.

The extinguisher was exhausted.

The laths and the inner face of the shelter were slightly charred and the loose material consumed. (*See Fig. R.*)

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FIG. *Q.* TEST NO. 11. (*View before Test.*)

FIG. *R.* TEST NO. 11. (*View after Test.*)

TEST No. 12.

Object of Test No. 12.—This test was undertaken to show the effect of the extinguisher upon burning petrol vapour.

Arrangements for Test No. 12.—Three floor boards were placed together and fastened underneath by cross battens and measured 20 ft. long by 1 ft. 9 in. wide (6·096 *m.* by 0·533 *m.*). The whole of the boards were first sprinkled with a pint of petrol, and then four pints (2·272 litre) of petrol were poured on.

Log of Test No. 12.—

NOTE.—This test was recorded as a "No Test," the arrangements, as intended by the Sub-Committee, having proved unsuitable.

RE-TEST No. 12A.

Object of Re-test No. 12A.—This test was undertaken to show the effect of the extinguisher upon burning petrol vapour.

Arrangements for Re-test No. 12A.—The arrangements were practically identical with those of Test No. 12, except that the joints were caulked and a small rim (bead) was fastened around the outside of the boards. Four pints (2·272 litre) of petrol were used.

Log of Re-test No. 12A.—The fire was lighted at one point.

One small extinguisher was immediately applied by a nominee of the Committee at first at 9 ft. (2·743 *m.*) distance and then at close quarters.

The burning spirit was swept off the boards by the force of the extinguisher, and burnt itself out on the ground.

The extinguisher was exhausted in 1 min. 23 secs.

TEST No. 14.

Object of Test No. 14.—This test was undertaken to show the effect of the extinguisher upon a burning heap of loose rubbish composed of wood-wool, shavings, hay, straw, waste paper, and cotton rags.

Arrangements for Test No. 14.—A heap of rubbish composed of a quarter bale of wood-wool, half a sack of shavings, a quarter truss of hay, half a bundle of straw, one bushel of waste paper, and one bushel of clean and dry cotton rags was well mixed and loosely stacked on floor of No. 2 Hut.

Log of Test No. 14.—The fire was allowed to burn for 2 mins.

The flames obtained a good hold of the material.

One small extinguisher was first applied by a nominee of the testor, who started at 6 ft. (1·828 *m.*) distance.

The fire was slightly checked at this stage.

One additional small extinguisher and one additional large one were then applied.

At the end of 9 mins. 30 secs. the heap was left extinguished, but smouldering was found to be occurring later, and it continued for a considerable time.

Eventually the smouldering remnants were stamped out.

FIG. S. TEST NO. 16. (*View before Test.*)

FIG. T TEST NO. 17. (*View before Test.*)

FIG. V. TEST NO. 18. (*View before Test.*)

TEST No. 15.

Object of Test No. 15.—This test was undertaken to show the effect of the extinguisher upon burning heaps of oily rags and dirty cotton waste.

Arrangements for Test No. 15.—Two heaps of oily rags and dirty cotton waste were arranged on the floor of Hut No. 1 on a tripod of sticks to make the heap have a height of about 15 in. (0·381 *m.*).

Log of Test No. 15.—The fire was lighted at each heap and allowed to burn for 1 min. 30 secs.

The flames obtained a fair hold of the material.

One small extinguisher was operated by a nominee of the testor standing at first 4 ft. 6 ins. (1·372 *m.*) away, and afterwards at close quarters from one side only.

At the end of 1 min. 5 secs. the extinguisher was exhausted, and the fire apparently extinguished.

About half of each heap was consumed, but one of the heaps later on burst into flame again, and was stamped out.

TEST No. 16.

Object of Test No. 16.—This test was arranged to show the effect of the extinguisher upon a bonfire composed of hay, straw, wood-wool and shavings when in an exposed position.

Arrangements for Test No. 16.—A bonfire composed of a quarter truss of hay, half a truss of straw, a quarter bale of wood-wool, and half a sack of shavings well mixed was loosely piled on the roof of Hut No. 1A. (*See Fig. S.*)

Log of Test No. 16.—The fire was allowed to burn for 1 min. A nominee of the testor stood on the ground, and at the end of 1 min. went up the ladder on to the roof and commenced extinguishing operations.

He stood for the first minute about 13 ft. (3·962 *m.*) off and afterwards went to close quarters.

The flames obtained a good hold of the material.

The fire was almost extinguished at the end of 5½ mins.

One large and two small extinguishers were applied and exhausted.

The smouldering material had to be well raked over and stamped out.

TEST No. 17.

Object of Test No. 17.—This test was undertaken to show the effect of the extinguisher upon a series of burning heaps of oily rags and dirty cotton waste.

Arrangements for Test No. 17.—A series of six small heaps of oily rags and dirty cotton waste were arranged on the floor of Hut No. 1A, and these were connected by trains of similar material soaked in spirit. (*See Fig. T.*).

Log of Test No. 17.—The fire was lighted in two places and allowed to progress for 1 min. 30 secs.

The flames obtained a fair hold of all the heaps.

Two small extinguishers were operated by a nominee of the Committee, who stood first 6 ft. (1·828 *m.*) away, and extinguished four heaps, but then worked at close quarters and put out the other two.

Three heaps were extinguished in 2 mins., and the whole in 3 mins.

TEST No. 18.

(*Testor's Demonstration Test.*)

Object of Test No. 18.—This test was undertaken, at the request of the testor, to show the effect of the extinguisher upon a burning "lake" of tar.

Arrangements for Test No. 18.—A small well, measuring 6 ft. by 6 ft. and 6 in. deep (1·828 *m.* by 1·828 *m.* by ·153 *m.*) was made by brick work and loose sand and one barrel of tar was poured in same. Three handfuls of wood-wool sprinkled with paraffin were placed in the tar so as to expedite the tar catching fire. (*See Fig. V.*)

Log of Test No. 18.—The fire was lighted at one point and allowed to burn for 2 mins. 50 secs.

One small extinguisher was operated by a nominee of the testor at 12 ft. (3·657 *m.*) distance.

The fire was extinguished in 31 secs.

The extinguisher was not exhausted.

RE-TEST No. 18A.

(*Testor's Demonstration Test.*)

Object of Re-test No. 18A. (By order of the Committee)—This test was undertaken to show the effect of the extinguisher upon a burning "lake" of tar. No spirit to be used.

Arrangements for Re-test No. 18A.—The arrangements were practically identical with those for Test No. 18, but no spirit was used.

Log of Re-test No. 18A.—The fire was lighted at two points and allowed to burn for 1 min. 20 secs.

NOTE.—This was 1 min. 30 secs. less than in Test No. 18.

The tar did not boil, but the period of start had to be limited owing to the dense smoke occasioned.

One small extinguisher was used by the nominee of the testor.

The fire was extinguished in 1 min. 27 secs.

The extinguisher was not exhausted.

GENERAL ARRANGEMENTS.

The tests and re-tests were carried out according to the procedure laid down by the Executive for investigations of this description and were conducted by a Sub-Committee comprising :—

Mr. Percy Collins, J.P., F.S.S., *Directing Member.*
Mr. H. S. Folker, F.A.I. (Vice-President National Fire Brigades' Union), *Deputy Directing Member.*
Mr. J. Herbert Dyer (Senior Vice-President National Fire Brigades' Union).
Mr. Ellis Marsland (District Surveyor).
Mr. James Sheppard, A.Inst.E E. (Surveyor, North British and Mercantile Insurance Company).
Mr. E. J. A. Fulkes (Surveyor, Royal Insurance Company).
Mr. Wm. Grellier, F.R.I.B.A. (District Surveyor).

Mr. A. H. Lister assisted the Sub-Committee.

On February 27th, the whole of the members of the Sub-Committee, except Mr. Grellier, were on duty. On May 1st, Messrs. Folker, Marsland, Fulkes and Grellier were on duty.

The Council was represented for the testing operations of February 27th, 1907, by —

Sir Boverton Redwood, F.R.S.Ed. (Adviser on Petroleum to the Admiralty and the Home Office).

The Executive was represented for the testing operations of February 27th, 1907, and May 1st, by—

Mr. Edwin O. Sachs, F.R.S.Ed. (Chairman).

and on February 27th, by—

Mr. Max Clarke, F.R.I.B.A.
Mr. Chas. E. Goad, M.Am. Soc.C.E.

The Committee's Hon. Medical Officer, Surgeon-Major R. J. Maitland-Coffin, F.R.C.P., was in attendance on February 27th and May 1st.

The general body of members were represented for the testing operations of February 27th, 1907, by—

Messrs. Wm. Coxeter (Abingdon Fire Brigade); Matt. Garbutt, F.R.I.B.A.; S. G. Gamble, A.M.Inst.C.E. (Divisional Officer, London Fire Brigade); Louis T. Healy, A.Inst.E.E. (Royal Insurance Company); F. W. Hamilton, F.R.I.B.A. (District Surveyor); Harry King (Surveyor, Royal Exchange Assurance Company); William Pett (Chief Officer, Exeter Fire Brigade); Jos. Randall, A.M.Inst.C.E.; Percy E. Ridley, F.S.I.; Lieut. S. Sladen, R.N. (Divisional Officer, London Fire Brigade).

Messrs. Minimax, Ltd., were represented on February 27th, by—Messrs. H. Evans, T. Hayward, C. Messing, E. Bruce Miller, H. M. Read, A. Smith, A. A. Yorke; and on May 1st, by—Messrs. C. Messing and H. M. Read.

The following visitors attended at the Testing Station by special invitation of the Executive during the testing operations of February 27th, 1907 :—

Messrs. Arthur Ashbridge, F.R.I.B.A. (District Surveyor); T. R. Brooke; J. H. Beckett; G. H. Beaman (Guardian Assurance Company); C. H. Colson, M.Inst.C E. (Supt. Civil Engineer, Director of Works Department, Admiralty); A. R. Dyer, A.M.Inst.C.E. (Assistant Divisional Officer, London Fire Brigade); Capt. A. H. Desborough, R.A. (Inspector of Explosives, Home Office); W. D. Forbes; Murray Griffiths; E. B. Hiles (Fire Manager, Royal Exchange Assurance Company); T. B. Johnson (General Post Office); G. F. Ludford (Examiner of Dockyard Works, Admiralty); C. F. Merriam; S. Marsland; Geo. Stubbings (Supt. Fire Brigade, Great Eastern Railway).

Signed,

For the Sub-Committee conducting the Test :—
PERCY COLLINS (*Directing Member*).

For the General Testing Arrangements Sub-Committee :—
HORACE S. FOLKER.

For the Executive :—
JAMES SHEPPARD.

Published by the Committee as directed by the Executive.

C. F. ADAMI
(*Assist. Secretary*).

Date—August 2nd, 1907.

Verified a true copy of the Report as ordered to be published.

ROSE, INNES, SON AND CRICK (*Solicitors*).

Date—September 2nd, 1907.

Lists of the Committee's Publications, Contents of the Committee's Journal, etc., are obtainable upon application to the Assistant Secretary, 1, Waterloo Place, Pall Mall, London, S.W.

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"RED BOOKS" OF THE
BRITISH FIRE PREVENTION COMMITTEE.—No. 122.

Edited by the Executive.

Fire Tests with Petrol Tanks.

PETROL TANKS and METAL VESSELS FITTED WITH SAFETY DEVICES,

COMPRISING

a Combination of

(a) SAFETY PLUGS, (b) INTERIOR SAFETY TUBES,

MADE BY

FABRIK EXPLOSIONSSICHERER GEFÄSSE (G.M.b.H.),
SALZKOTTEN, GERMANY,

AND SUBMITTED FOR TEST BY

MESSRS. CAIRNS PATENTS, LTD., LONDON.

The Committee's Report.

LONDON, 1907.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE,
(*Founded 1897—Incorporated 1899*).
1, WATERLOO PLACE, PALL MALL.

Supplement to "Red Book" No. 122.

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BRITISH FIRE PREVENTION COMMITTEE.—G.

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WITH
PETROL TANKS.

PETROL TANKS AND METAL VESSELS,

fitted with "Henze" Safety Devices

COMPRISING:

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(a) Safety Plugs. (b) Interior Safety Tubes,

MADE BY

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MESSRS. THE SAFETY NON-EXPLOSIVE RESERVOIR CO., LTD.,

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The Committee's Memoranda.

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Sixpence.

Fig. 5. DEMONSTRATION C. " PROTECTED " TANK OF 132 QTS. CAPACITY AS USED IN DEMONSTRATION C.
(Showing application of safety plug and safety tube.)

Fig. 1. DEMONSTRATION C. " PROTECTED " TANK OF 132 QTS. CAPACITY.
(View taken after action of safety plug and during application of petrol from a small can.)

"RED BOOKS" of the

BRITISH FIRE PREVENTION COMMITTEE.—No. 122.

Edited by the Executive.

Fire Tests with Petrol Tanks.

PETROL TANKS AND METAL VESSELS,

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COMPRISING :

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LONDON, 1907.

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(Founded 1897—Incorporated 1899),
1, WATERLOO PLACE, PALL MALL

Two Shillings and Sixpence.

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OBJECTS OF THE COMMITTEE.

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts, and translations.

To undertake such independent investigations and tests of materials, methods, and appliances as may be considered advisable.

The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion criticisms, or comparisons.

The Committee is not responsible for the views of individual authors as expressed in Papers or Notes, but only for such observations as are formally issued on behalf of the Executive.

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Fig. 4. "PROTECTED" TANK OF 132 QTS. CAPACITY AS USED IN TEST NO. 6.
(Showing application of safety plug and safety tube.)

Fig. 6. "PROTECTED" TANK OF 132 QTS. CAPACITY.
(View taken after action of safety plug and during application of petrol from a small can, remains of bonfire still being alight (see Test No. 6)).

NOTE.

The safety devices for petrol tanks under examination, comprised a combination of (A) a metal safety plug, and (B) an interior wire gauze safety tube constructed on the well-known principles of the wire gauze cylinder in the Davy lamp.

It would appear from the various tests that the metal safety plug as applied to the stopper or cap of a petrol tank or other metal vessel containing petrol is of the greatest value as a safeguard against explosion (provided the tank or vessel is well and substantially made), for the plug effectually prevents the bursting of closed vessels when in a fire and the consequent dispersion of the highly inflammable contents.

The value of such metal safety plugs for vessels of all sizes may be deemed of such high importance as to make their addition to all petrol tanks and vessels containing similar highly inflammable liquids compulsory. The safety plugs should have the serious consideration of the authorities concerned, and they should certainly be immediately demanded as a condition of license where permits are requested for the storage or carriage of such liquids.

The other device, described in short as the safety tube—*i.e.*, the interior wire gauze safety tube—designed to prevent the explosion of vapour and air in a vessel on application of a flame, is—when well made and properly maintained—of considerable value, but the necessity for such a device on all tanks of all sizes is much more difficult to advocate for compulsory installation than the metal safety plug.

HORACE FOLKER.

1, WATERLOO PLACE,
LONDON, S.W.,
June, 26 *h*, 1907.

Fig. 10. VESSELS S', T', U', UNPROTECTED, AFTER EXPLOSION IN TEST NO. 12, PART *b*.

Fig. 11. CROUP OF EIGHT UNPROTECTED VESSELS AFTER EXPLOSION.

OFFICIAL REPORTS

OF THE

British Fire Prevention Committee

[FOUNDED 1897—INCORPORATED 1899].

FIRE TEST NO. 88.—MAY 1ST AND 29TH, 1907.

PETROL TANKS AND METAL VESSELS
Fitted with Safety Devices,

COMPRISING:

a combination of

(*a*) Safety Plugs, (*b*) Interior Safety Tubes,

MADE BY

FABRIK EXPLOSIONSSICHERER GEFÄSSE (G.m.b.H.), SALZKOTTEN, GERMANY.

AND SUBMITTED FOR TEST BY

Messrs. CAIRNS PATENTS, LIMITED, LONDON.

OBJECT OF TEST.

To test the efficiency of the safety devices (A, safety plugs: B, interior wire gauze safety tube), when fitted to petrol tanks and other metal vessels containing petrol, the safety devices, comprising a combination of a metal safety plug fitted to the stopper of the tank or vessel and interior wire gauze tubes enclosed in perforated metal fitted to the filling openings and drawing-off openings of such tanks or vessels.

Note.—For purposes of comparison, petrol tanks and other metal vessels not fitted with any safety device were to be similarly tested.

Note.—For the purpose of comparison, certain vessels fitted with the safety plug but *not* with the safety tube were also tested.

Note.—The tests comprised tests undertaken by order of the Committee and tests undertaken at the request of the testor.

The following were the tests applied.

Object of Test No. 1. (*Vessels A and B.*)—To note the effect of fire on two metal vessels fitted with safety plugs and tubes, each having a capacity of 3 *l.* (2·641 qts.), half filled with petrol, when in a bonfire of wood-wool and wood, in such positions as to allow of an outflow of vapour, but no liquid, the vessel (*B*) to be "open" (*i.e.* to have cap with safety plug removed) and the other (*A*) to be "closed" (*i.e.* to have cap with safety plug in place).

Object of Test No. 2. (*Vessels C and D.*)—To note the effect of fire on a metal can and filling can fitted with plug and tubes,

the can *C* having a capacity of 5 *l.* (4·402 qts.) and the filling can (*D*) of ½ *l.* (0·440 qts.), each about half filled and placed together, stoppers being removed, ½ *l.* (0·440 qts.) of petrol to be spilled on the ground about the drum and can and set on fire by a dropped lighted match.

Object of Test No. 3. (*Vessel K.*)—To note the effect of fire on a metal cylindrical storage vessel, fitted with outlet tap, of 15 *l.* (13·206 qts.) capacity, fitted with safety plug and tube, one third filled with petrol, closed, when in a bonfire of wood-wool and wood.

Object of Test No. 4. (*Vessel E.*)—To note the effect of fire on a steel cylinder tank (with electrically welded joints) of a capacity of 25 *l.* (22·110 qts.), fitted with safety plug and tubes, half filled with petrol, when in a bonfire of wood.

Object of Test No. 5. (*Vessel F.*)—To note the effect of fire on a vessel of ½ *l.* (0·440 qts.) capacity, fitted with safety plug and tubes, with cap removed containing a small quantity of petrol, laid on its side on a table so that the vapour, but no petrol, could flow out and disperse on the surface of the table.

Object of Test No. 6. (*Vessel G.*)—To note the effect of fire on a metal drum (*G*) protected with safety plug and tube, of a capacity of 150 *l.* (132·058 qts.) half filled with petrol, placed on an iron stand, with a bonfire of wood-wool and wood below, the flames to be checked at one point so that petrol could be poured from a filling can (similar to can *A*) into the filling opening of the metal drum.

Object of Test No. 7. (*Comparative test, Vessels H, I, J.*)—To note the effect of fire on an iron cylinder (*H*) of 25 *l.* (22·110 qts.) with welded joints (similar to vessel *E*) with screwed stopper, but *not* fitted with either safety plug or tube, a transport can of 15 *l.* capacity (13·206 qts.) (*I*), fitted with safety plug and tube (made extra strong) and a 3 *l.* (2·641 qts.) filling can (*J*) with neither safety plug, or tube, each about half full of petrol to be placed together in a fierce bonfire of wood and wood-wool.

Object of Test No. 8. (*Vessel L.*)—To note the effect of fire on a vessel, fitted with safety plug *only*, of a capacity of 5*l.* (4·402 qts.) (*L*) one quarter filled with petrol, firstly as to efficiency of safety plug and secondly as to whether any explosion of the contents would occur during the burning of the vapour at the outlet after safety plug had been blown out.

Object of Test No. 9. (*Vessel N.*)—To note the effect of flame (at a distance of 6 ft.) (1·828 *m.*) upon a vessel with a capacity of 10 *l.* (8·804 qts.), of the filling can type (*N*), not fitted with either safety plug or tube, containing a small quantity of petrol, so placed that the petrol vapour could flow from the spout.

Note.—For the purpose of this test the spout was extended by means of a ¾ in. (.019 *m.*) iron pipe, 6 ft. long (1·828 *m.*), the vapour being ignited at the further end.

Object of Test No. 10. (*Vessels O, P.*) (*Comparative experimental test*)—To show the effect of flame upon ether vapour when protected by gauze.

Object of Test No. 11. (*Vessel Q—Tubes A and B. Ex-*

perimental Comparative test.)—To show the effect of the wire gauze safety tube with flame inside and ether vapour outside.

Part a.—A small storage reservoir partly filled with ether placed on its side to allow the vapour to escape on to a table. As soon as sufficient vapour had been allowed to collect on the table the wire gauze tube with a small flame burning inside was placed on the table.

Part b.—A similar test, but with an ordinary metal tube with openings at the side, and a small flame burning inside.

Object of Test No. 12. (Vessels R, S, T, U—R', S', T', U', and others.)—To show the effect of the application of flame to vessels containing petrol (or petrol vapour) when flame is applied to the ordinary unprotected opening as compared with its application to vessels having openings fitted with safety tubes.

SUMMARY OF EFFECT.

In no instance did the petrol tanks or vessels fitted with metal safety plugs and containing petrol explode or burst, when "closed" and subjected to fire. The metal safety plugs blew out and the petrol vapour caught fire over the opening thus formed, and burned without spreading.

The petrol tanks or metal vessels containing petrol which were not fitted with metal safety plugs exploded with considerable force when "closed" and subjected to fire, and the petrol therein contained was spread some distance.

In every instance the petrol tanks or metal vessels fitted with interior wire gauze safety tubes subjected to fire, when "open," did not explode nor did the petrol or vapour contained in them catch fire. Vapour outside the openings alone ignited.

In twelve out of seventeen instances where petrol tanks or vessels containing petrol, not fitted with safety tubes were subjected to fire, when "open," explosions occurred of varying force. In one of these instances the flame travelled 6 ft. (1·828 *m.*) up a ¾ in. (·019 *m.*) pipe and caused an explosion. In the remaining five cases no explosions occurred.

DESCRIPTION OF THE SAFETY DEVICES AND THE APPLIANCES UNDER TEST.

The following were the appliances under test with dimensions, capacity, etc.:—

For Test No 1.

Vessels A and B.—Each vessel comprised a *protected* round can with spout, 3 *l.* (2·641 qts.) capacity, funnel-shaped at top, one wire and one sheet metal handle, 11¾ in. high by 5½ in. diameter (·298 *m.* by ·139 *m.*) gauge of metal 25. One safety plug and two safety tubes.

FOR TEST NO. 2.

Vessel D.—One *protected* round can with spout, ½ *l.* (0·440 qts.) capacity, funnel-shaped at top, one wire and one sheet metal handle, 6⅞ in. high by 3 in. diameter (·175 *m.* by ·076 *m.*) gauge of metal 26. One safety plug and two safety tubes.

Vessel C.—One *protected* square petrol can, 5 *l.* (4·402 qts.) capacity, fitted with separate air inlet, one wire handle on top, 10⅜ in. high by 7 in. wide by 4⅞ in. deep (·264 *m.* by ·178 *m.* by ·124 *m.*); gauge of metal 25. One safety plug and two safety tubes.

FOR TEST NO. 3.

Vessel K.—One *protected* small storage reservoir, round, 15 *l.* (13·206 qts.) capacity, fitted with petrol outlet tap in addition to filling opening at the top and two wire handles at the sides, 17½ in. high by 9 in. diameter (·444 *m.* by ·228 *m.*); gauge of metal 22. One safety plug and two safety tubes.

FOR TEST NO. 4.

Vessel E.—One *protected* electrically-welded transport barrel, 25 *l.* (22·110 qts.) capacity, with device fitted in centre of length. 18½ in. long by 11 in. diameter (·469 *m.* by ·279 *m.*); gauge of metal 16. One safety plug and one safety tube.

FOR TEST NO. 5.

Vessel F.—One *protected* round can with spout, ½ *l.* (·440 qts.) capacity, funnel-shaped at top, one wire and one sheet metal handle, 6⅞ in. high by 3 in. diameter (·175 *m.* by ·076 *m.*); gauge of metal 25. One safety plug and two safety tubes.

FOR TEST NO. 6.

Vessel G.—One *protected* large rivetted transport barrel, 150 *l.* (132·058 qts.) capacity, with device fitted in centre of length, 33½ in. long by 20 in. diameter. (0·851 *m.* by 0·508 *m.*); gauge of metal 15. One safety plug and one safety tube.

NOTE.—One *protected* can (g) with a capacity of 3 *l.* (2·641 qts.) as described for vessels A and B (Test No. 1) was used for pouring petrol into the flames.

FOR TEST NO. 7 (COMPARATIVE TEST).

Vessel H.—One *unprotected* electrically-welded transport barrel, 25 *l.* (22·110 qts.) capacity, round, with screwed stopper in centre of length, 18½ in. long by 11 in. diameter (·469 *m.* by ·279 *m.*); gauge of metal 16. *No* safety plug and *no* safety tubes.

NOTE.—This vessel corresponds with vessel E, used for Test No. 4.

Vessel I.—One *protected* transport can, 15 *l.* (13·206 qts.) capacity, two wire handles at the sides, 14½ in. high by 9¼ in. diameter (·368 *m.* by ·235 *m.*); gauge of metal 20. One safety plug and one safety tube.

Vessel J.—One *unprotected* round can with spout, 3 *l.* (2·641 qts.) capacity, one wire and one sheet metal handle, funnel-

shaped at top, 11¾ in. high by 5½ in. diameter (·298 *m.* by ·139 *m.*); gauge of metal 25. *No* safety plug and *no* safety tubes.

NOTE.—This vessel corresponds with vessels A and B used for Test No. 1.

FOR TEST NO. 8.

Vessel L.—One *partially protected* round can, 5 *l.* (4·402 qts.) capacity, no handles, 12¾ in. high by 6¾ in. diameter (·323 *m.* by ·172 *m.*); gauge of metal 22. One safety plug and *no* safety tube.

FOR TEST NO. 9.

Vessel N.—One *unprotected* square can with spout, 10 *l.* (8·804 qts.) capacity, one sheet metal handle, 16 in. high by 7 in. square (·406 *m.* by ·178 *m.*); gauge of metal 25. *No* safety plug and *no* safety tube.

FOR TEST NO. 10 (COMPARATIVE EXPERIMENTAL TEST).

Vessel O.—One shallow, round reservoir fitted with *gauze lid*, 1 *l.* (·880 qts.) capacity, 2¼ in. high by 6¼ in. diameter (·057 by ·158 *m.*); gauge of metal 25.

Vessel P.—One shallow, round reservoir fitted with *perforated lid*, 1 *l.* (·880 qts.) capacity, 2¼ in. high by 6¼ in. diameter (·057 *m.* by ·158 *m.*); gauge of metal 25.

FOR TEST NO. 11 (COMPARATIVE EXPERIMENTAL TEST).

Vessel Q.—One *protected* square Petrol Drum fitted with air inlet and wire handle. 5 *l.* (4·402 qts.) capacity 10⅞ in. high by 7 in. wide by 4⅞ in. deep (·276 by ·178 by ·124 *m.*); gauge of metal 25. Two safety tubes.

Tube A.—Gauze tube, 11 in. high by 2¼ in. wide (·279 by ·057 *m.*), with candle inside.

Tube B without gauze 11 in. high by 2¼ in. wide (·279 by ·057 *m.*) with candle inside.

FOR TEST NO. 12 (COMPARATIVE TEST).

Three *protected* square vessels each fitted with one safety tube, and one sheet metal handle. Gauge of metal 25.

Vessel R.—10 *l.* (8·804 qts.) capacity, 15¾ in. high by 7¼ in. square (·399 *m.* by ·184 *m*).

Vessel S.—15 *l.* (13·206 qts.) capacity, 21½ in. high by 7¼ in. square (·5460 *m.* by ·1841 *m.*).

Vessel T.—20 *l.* (17·608 qts.) capacity, 22¼ in. high by 8 in. square (·565 *m.* by ·203 *m.*).

Vessel U.—A round *protected* vessel fitted with two safety tubes, gauge of metal 24; 70 *l.* (61·627 qts.) capacity, 33¼ in. long by 12⅛ in. diameter (·844 *m.* by ·308 *m.*)

Vessels R', S', T', U'.—Four *unprotected* vessels with *no* safety plug and *no* safety tubes, each fitted with one sheet metal handle, gauge of metal 25, of similar capacity and shape as vessels *R*, *S*, *T*, *U*.

Additional Vessels—Various additional vessels *unprotected* of similar shapes and sizes.

PRINCIPLE OF THE SAFETY DEVICES.

The testor states that the safety devices comprise the fitting of—(*a*) one or more metal safety plugs, as a combined device

with a view of preventing the explosion of *open* vessels containing inflammable liquids, the contents of which, or vapour therefrom, may come in contact with a flame, and also preventing the explosion of *closed* vessels which may get heated, as in the case of fire ; (*b*) one or more interior wire gauze safety tubes.

The testor states that the complete devices can be easily adapted to all existing cans, tanks, etc., no matter what size or shape.

The interior safety tube, the testor considers, should be fitted to *all* the openings of the vessel.

Fig. 3. APPLICATION OF SAFETY TUBE TO FITTING OPENING OF CAN.

He describes the action as follows :—

A gauze tube is fitted to the opening and protected by two perforated metal cylinders. In the case of an "open" vessel, the gauze—as a good conductor of heat—very rapidly abstracts the heat from and thereby chokes the flame. If fire occurs outside an open vessel through any accident, the heating of the gauze cylinder which extends to the bottom of the reservoir, and is therefore always in contact with the liquid, causes gas to be generated more quickly than it can be consumed by the flame. The gas is forced out through the gauze cylinder and is consumed by a steady flame *above* the opening of the reservoir. The flame cannot enter the vessel or come in contact with the gas inside the vessel, and therefore prevents the "open" vessel from exploding. Further, the flame can easily be extinguished at the opening of a vessel by the application of a damp rag, or by throwing water over it, which is contrary to the usual experience with inflammable liquids burning at the opening of unprotected vessels.

In order to prevent the explosion of *closed* vessels, at least one metal safety plug, or more—the testor states—should be fitted, according to the size and shape of the vessel.

The explosion or bursting of closed vessels is caused by the pressure of the gas (which has no means of escape) generated inside the reservoir, by too excessive outside heat.

The safety plug owing to its construction is blown off by the inside pressure of the gas. The gas, which would otherwise explode or burst the vessel, escapes through the gauze tube, without any danger of an explosion.

Should a naked light come in contact with the emerging gas, it will be consumed *over* the opening as described in the case of the *open* vessel above, and can be easily extinguished by throwing water over it or by the application of a damp rag, saving the liquid, which would otherwise be consumed.

The combined metal safety plug and interior wire gauze safety tube are generally screwed to the principal filling opening of a vessel, those fitted to other outlets or inlets being generally rivetted in.

THE SAFETY DEVICES USED DURING TESTS.

The metal safety plugs, circular in plan, varied in diameter from $\frac{3}{4}$ in. (·019 *m.*) to 4 in. (·102 *m.*), comprised pieces of

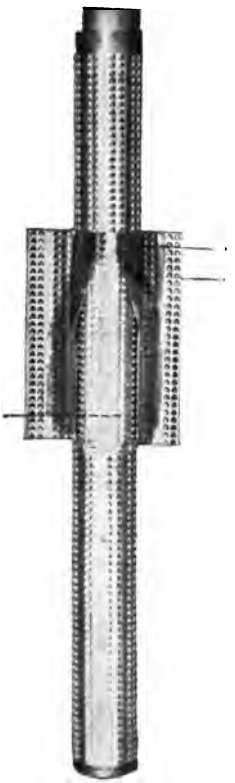

Fig. 1. THE SAFETY TUBE.

Fig. 2 APPLICATION OF THE SAFETY TUBE.

metal of varying gauge inserted into the screwed metal stoppers of the vessel and held in position by a fusible solder.

The interior safety wire gauze tube and cylinders were fitted to *all* openings of the " protected " vessels comprising in each case 1 wire gauze tube (the gauze being from 42 to 21 meshes

to the in.) and 2 perforated cylinders of metal—about 12 perforations of about $\frac{1}{8}$ in. (·003 *m.*) diameter to the sq. in., the tubes screwed to the principal filling openings extending to the bottom of the vessels. The other openings were fitted with gauze only.

The testor states that the composition of the fusible solder area (*i.e.*, cooling surface) of cylinders and sizes of safety plugs and mesh and material of gauze and perforated cylinders are the result of many years' experience of the makers of the vessels and are made to suit the various requirements such as strength, use and capacity of reservoirs, the nature and chemical actions of the liquids and climatic conditions.

TESTING PLANT.

The tests were conducted at the Committee's Testing Station No. 6, North Bank, Regent's Park.

Tests No. 1, 2, 3, 4, 6 were conducted in the open; tests Nos. 5, 10, 11 in the committee room; tests Nos. 7, 8, 12 in Hut No. 3; and test No. 9 in Hut No. 2.

Hut No. 3 was an open hut—*i.e.*, a hut without roof, measuring 22 ft. 3 in. by 15 ft. floor surface (6·781 by 4·572 *m.*).

Hut No. 2 was a closed hut measuring 22 ft. 3 in. by 10 ft. by 8 ft. high (6·781 by 3·048 by 2·438 *m.*).

The petrol used was "Pratt's Motor Spirit, Specific gravity ·715°. According to the Anglo-American Oil Co. (the makers of Pratt's Motor Spirit), the flash point is anything above freezing point.

PREPARATIONS FOR TESTS.

The tests were undertaken on May 1st and 29th, 1907. Tests Nos. 1, 2, 3, 4, 5, 6, 7, were undertaken on May 1st. They commenced at 2.45 p.m., and were concluded at 5.30 p.m.

Tests Nos. 8, 9, 10, 11, and 12, were undertaken on May 29th. They commenced at 2.15 p.m. and were concluded at 6.30 p.m.

The weather reports read as follows :—

At 3 p.m. on May 1st, the meteorological observations taken at the Botanic Gardens, Regent's Park, read as follows :—

"State of weather, cloudy, wind N.W.; barometer, 29.84 in. (·758 *m.*); wet bulb 42.2° Fahr. (5·6 *C.*); dry bulb, 48·5° Fahr. (9·1 *C.*). Remarks: Dull afternoon.

At 3 p.m. on May 29th, 1907, observations read as follows :

State of weather: cloudy; wind E.S.E.; barometer 30.17; (·763*m.*); wet bulb 46·2° Fahr. (7·8 *C.*); dry bulb, 53·5° Fahr. (11·9 *C.*). Remarks: Fine bright afternoon.

All the vessels were filled by the testor to the extent as directed by the sub-committee in charge.

The operation of igniting the bonfires, firing petrol, etc., was generally undertaken by a nominee of the Testor.

The following rules were issued by the Sub-Committee in charge of the tests, and served as a guide during the testing operations :—

"The tests will be taken in the order of number, but subject to alteration by the Directing Member.

Each of the tests may be repeated at the discretion of the Sub-Committee in charge, with a corresponding vessel unprotected, or partially protected.

The start for lighting up any test will be announced by whistle, and from the sounding of this whistle, times will be taken by stop watch. The close of any one test will be announced by the sounding of the whistle.

One member of the Sub-Committee in charge will act as time-keeper and his decision is final on questions of time.

The testor will provide the liquid contents (petrol, etc.), and will be responsible for its storage, use and application on the ground. Samples of the contents may be drawn by the Directing Member for analysis or examination.

Great care must be taken by the testor and all concerned that no petrol is spilled about the premises or on the clothes of any persons operating the tests.

Smoking will be strictly prohibited within the area of the testing ground allotted for these tests. (Police will be on duty with orders to stop smoking, as being highly dangerous in these tests.)

The arrangements are subject to alteration by the Directing Member."

THE OBJECT OF, ARRANGEMENTS FOR, AND LOG OF EACH TEST.

The tests were conducted as follows :—

TEST No. 1 (VESSELS A AND B).

Object of Test No. 1.—to note the effect of fire on two metal vessels, safety plugs and tubes, each having a capacity of 3 *l*, (2·641 qts.) half filled with petrol, when in a bonfire of wood-wool and wood, in such positions as to allow of an outflow of vapour, but no liquid—the vessel (B) to be "open" (*i.e.*, to have a cap with safety plug removed), and the other (A) to be "closed" (*i.e.*, to have cap with safety plug in place).

Arrangements for Test No. 1.—The vessels were half filled with petrol.

The bonfire was arranged in the open, the material being sprinkled with petrol prior to ignition. The vessels A and B were placed standing in the bonfire.

Log of Test No. 1.—The bonfire was ignited at one point and the flames were maintained and increased by an occasional application of petrol.

The vapour from the open top of the vessel B ignited and continued to burn until removed from the fire.

The safety plug in cap of vessel A blew out in 1 min. 30 sec. after the fire was lighted and burnt as mentioned for vessel B.

The fire was extinguished with water and sand after 5 mins.

There was no indication of flames having passed back into the vessel or of the petrol therein having ignited.

There was no explosion.

TEST No. 2 (VESSELS C AND D).

Object of Test No. 2.—To note the effect of fire on a metal can and filling can fitted with safety plug and tubes, the drum (C) having a capacity of 5 *l.* (4·402 qts.) and filling can D of ½ *l.* (·440 qts.) each, about half filled and placed together, stoppers being removed, ½ *l.* (·440 qts.) of petrol to be spilled on the ground about the drum and can and set on fire by a dropped lighted match.

Arrangements for Test No. 2.—The vessels (C) (5 *l.*—4·402 qts.) and D (½ *l.* — 0.440 qts.) were half filled with petrol and placed on a cement-paved floor in the open. About ·440 qts. (½ *l.*) of petrol was poured on the floor.

Log of Test No. 2.—The petrol on the floor around the vessels was ignited.

The metal plugs in the caps blew out in 3 mins. and the spout of can D melted off. The vapour ignited over the opening and at the hole where the spout had melted off.

There was no indication of flames having passed back into the vessels or of the petrol therein having ignited.

There was no explosion.

TEST No. 3 (VESSEL K).

Object of Test No. 3.—To note the effect of fire on a metal cylindrical storage vessel (K) fitted with outlet tap, of 15 *l.* (13·206 qts.) capacity, fitted with safety plug and tubes, one third filled with petrol, closed, when in a bonfire of wood-wool and wood.

Arrangements for Test No. 3.—The bonfire was arranged in the open; the material was sprinkled with petrol before ignition.

The vessel (K) was filled one third with petrol.

The bonfire was made up around the vessel.

Log of Test No. 3.—The bonfire was ignited at one point and the flames were increased by additional applications of petrol.

The safety plug in cap blew out in 15⅜ sec. and the vapour ignited above the opening.

The flame over vessel was extinguished by the pressing of a damp cloth over the opening where the plug had blown out.

The fire was put out after 5 mins. with water and sand.

There was no indication of flames having passed back into the vessel or of the petrol therein having ignited.

There was no explosion.

TEST No. 4 (VESSEL E).

Object of Test No. 4.—To note the effect of fire on a steel cylinder tank (with electrically-welded joints) fitted with safety plug and tube of a capacity of 25 *l.* (22·110 qts.), half filled with petrol, when in a bonfire of wood.

Arrangements for Test No. 4.—The vessel (E) was half filled with petrol.

The bonfire was arranged in the open, the material was sprinkled with petrol before ignition.

The bonfire was built over the vessel.

Log of Test No. 4.—The bonfire was ignited at one point and the flames were increased with petrol.

The safety plug came into operation in 57 secs.

The flames over the opening were extinguished by the application of a damp cloth.

The fire was extinguished with water and sand in 5 mins.

There was no indication of flames having passed back into the vessel or of the petrol therein having ignited.

There was no explosion.

TEST No. 5. (VESSEL F.)

Object of Test No. 5—To note the effect of fire on a vessel F.) of ½ *l.* (·440 qts.) capacity, fitted with safety plug and tubes with cap removed containing a small quantity of petrol, laid on its side on a table so that the vapour, but no petrol, could flow out and disperse on the surface of the table.

Fig. 5. GENERAL ARRANGEMENT OF A BONFIRE.

Arrangements for Test No. 5.—The Vessel (F) was quarter filled with petrol and laid on its side on a table. The test was conducted in the committee room.

Log of Test No. 5.—On the application of flame the vapour on the table ignited instantaneously and burned back to and ignited the vapour pouring out of the vessel, but neither the vapour nor the petrol in the vessel ignited.

There was no explosion.

TEST No. 6. (VESSEL G)

Object of Test No. 6.—To note the effect of fire on a metal drum (G) protected with safety plug and tube, of a capacity of 150 *l.* (132·058 qts.), half filled with petrol, placed on an iron stand, with a bonfire of wood-wool and wood below, the flames to be checked at one point so that petrol could be poured from a filling can (similar to can A) into the filling opening of the metal drum.

Arrangements for Test No. 6.—The vessel (G) was half filled with petrol. The bonfire was arranged in the open; the material was sprinkled with petrol before igniting. The bonfire was built round the vessel.

Log of Test No. 6.—The bonfire was ignited at one point.

The safety cap blew out with a loud report in 1 min. 33 secs, and the vapour ignited above the opening.

After 5 mins. 35 secs., the bonfire was checked and petrol was poured through the flames into the opening. (See Fig. 6, p. 4.)

The flames over the opening were then extinguished with a damp cloth.

The bonfire was extinguished after 10 mins.

There was no indication of flames having passed back into the vessel, or of the petrol therein having ignited.

There was no explosion.

TEST No. 7. (VESSELS H, I, J.)
(Comparative Test.)

Object of Test No. 7.—To note the effect of fire on an iron cylinder (H) of 25 *l.* capacity, (22·110 qts.) with welded joints (similar to vessel E), with screwed stopper but *not* fitted with either safety plug or tube, a transport can of 15*l.* capacity (13·206 qts.) (I), fitted with safety plug and tubes (made extra strong) and a 3 *l.* (2·641 qts.) filling can (J), with neither safety plug nor tube. each about half full of petrol, to be placed together in a fierce bonfire of wood and wood-wool.

Arrangements for Test No. 7.—The bonfire of wood and wood-wool was built centrally on the floor of uncovered Hut No. 3. The three vessels (H, I, J) were placed close together in the bonfire.

The bonfire was sprinkled with petrol before ignition. The cylinder H was laid horizontally on a stand, so that the ends were opposite certain central buttresses of the front and back (W. and E.) walls of Hut No. 3.

Log of Test No. 7.—The bonfire was ignited at one point.

In 1 min. 20 secs., the 3 *l.* filling can (J) exploded.

In about 3 mins. the safety plug from the protected vessel (I) blew off.

In 4 mins. 30 secs. a loud explosion followed by a volume of smoke and flame rising high above walls of hut indicated the explosion of cylinder H.

On examination of the débris (See Fig. 7) the vessel (I) fitted with safety plug and tube was found intact, excepting the safety plug, which had come into operation.

The welded cylinder H was found with one end blown out and the other end much dented (probably the result of being blown against the brick wall by the force of the explosion), distinct marks, 10 by 1½ by ¾ in. (·254 by ·038 by ·019 *m.*) being visible on the brickwork. (See Fig. 8, p. 20.)

The small 3 *l.* can (J) was found in pieces, all the joints having torn.

TEST No. 8. (VESSEL L.)

Test No. 8.—To note the effect of fire on a vessel fitted with

safety plug *only* of a capacity of 5 *l.* (4·402 qts.) (L) one quarter filled with petrol, firstly as to efficiency of safety plug and secondly as to whether any explosion of the contents would occur during the burning of the vapour at the outlet after safety plug had been blown out.

Arrangements for Test No. 8.—About 2 pints (1·136 *l.*) of petrol were placed in a vessel (L).

The vessel was first placed in a small bonfire of wood-wool in the centre of testing chamber No. 3 and then moved to other positions.

Log of Test No. 8.—The bonfire was lit at 2.20 p.m. and in 24 secs. the safety plug blew out. The vapour ignited at the opening and continued to burn for about 20 mins. when it was extinguished by the wind and was relit. This occurred several

(I) (H) (J)

Fig. 7. VESSELS H, I, AND J, AFTER TEST NO. 7.
(Vessels H and J were unprotected and burst.)

times, and at 2.45, as the vapour could not be relighted, the vessel was knocked over by the torch used in relighting and while on its side the vapour again relighted at the opening and again went out. This was repeated many times, the torch being kept near the stopper opening till 3.15, when the test was temporarily abandoned and the opening closed.

On continuing the test at 6 p.m. a fire was maintained round the vessel and the vapour burned at the opening till it was exhausted.

There was no explosion.

TEST No. 9. (VESSEL N.)

Object of Test No. 9.—To note the effect of flame (at a distance of 6 ft. (1·828 *m.*) upon a vessel with a capacity of 10 *l.* (8·804 qts.) of the filling can type (N) not fitted with either safety plug or

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tube, containing a small quantity of petrol so placed that the petrol vapour could flow from the spout.

NOTE.—For the purposes of this test, the spout was extended by means of a $\frac{3}{4}$ in. (·019 *m.*) iron pipe 6 ft. long (1·828 *m.*) the vapour being ignited at the further end.

Arrangements for Test No. 9.—$\frac{3}{8}$ qt. (0·326*l.*) of petrol was placed in can N.

Fig. 8. INDENTATION IN BRICKWORK, SHOWING VIOLENCE OF EXPLOSION OF UNPROTECTED VESSEL H IN TEST NO. 7.

The can was placed in Hut No. 2, tilted, the can and pipe being kept within the hut (See Fig. 9).

The can was warmed with hot bricks and the warmth maintained by the bricks being sprinkled occasionally with petrol and ignited.

Log of Test No. 9.—The flame was easily ignited at the further end of the pipe at 3 p.m. It remained ignited.

At 5.20 the screw stopper was removed from the vessel after first extinguishing the flame.

On relighting, the flame was considerably longer but rapidly reduced till only a small blue spot was visible at the end of pipe.

At 5.25 this disappeared and was followed in about a second by an explosion in the vessel, the flame having travelled back along the pipe and exploded the vapour in the vessel.

A small quantity of the petrol remained in the vessel.

TEST No. 10. (VESSELS O, P.)
(Comparative Experimental Test.)

Object of Test No. 10.—To show the effect of flame upon ether vapour when protected by gauze.

Arrangements for Test No. 10.—A round shallow reservoir of a capacity of about 1 *l.* (0·880 qts.), and fitted with a lid, the large opening of which was covered with wire gauze.

Light to be applied over wire gauze.

Wire gauze to be removed and a perforated metal cover used in place thereof.

Log of Test No. 10.—The vessel containing the ether and fitted with wire gauze cover was warmed and light applied with no result.

Fig. 9.—SHOWING ARRANGEMENT OF UNPROTECTED VESSEL N FOR TEST NO. 9.

The wire gauze cover was then removed and the perforated metal one substituted, when on the application of a light, the vapour immediately ignited.

TEST No. 11 (VESSEL Q, TUBES A AND B.)
(Comparative Experimental Test).

Object of Test No 11.—To show the effect of the wire gauze safety tube with flame inside and ether vapour outside.

Part a.—A small storage reservoir partly filled with ether placed on its side to allow the vapour to escape on to a table. As soon as sufficient vapour had been allowed to collect on the table the

wire gauze tube with a small flame burning inside was placed on the table.

Part b.—A similar test, but with an ordinary metal tube with openings at the side, and a small flame burning inside.

Arrangements for Test No 11.—A metal vessel (Q) fitted with interior safety tube, and containing a small quantity of ether, was warmed and then laid on its side with the stopper removed.

Two tubes, each containing a small piece of candle, one composed of fine wire gauze, and the other of perforated metal.

Log of Test No. 11.—The candle in gauze tube was lighted and placed close to the opening of vessel containing the ether, the vapour of which ignited inside the tube and burned with a flame about 9 ins. (·228 *m.*) long, but no vapour outside the cylinder became ignited.

The gauze tube was then removed and the perforated metal one containing a lighted candle was put in its place, close to the open vessel of ether. In a few seconds the vapour all round the flame both inside and outside the tube caught fire, as did the vapour being emitted from the vessel containing the ether.

The two experiments were repeated several times with exactly similar results.

TEST No. 12 (VESSELS R, S, T, U—R′, S′, T′, U′, AND OTHERS.)

(Comparative Test.)

Object of Test No. 12.—To show the effect of the application of flame to vessels containing petrol (or petrol vapour) when flame is applied to the ordinary unprotected opening as compared with its application to vessels having openings fitted with safety tubes.

Arrangements for Test No. 12.—*Part a*—Four protected vessels (R, S, T, U), fitted with interior safety wire gauze tubes, of a capacity of 10 *l.*, 15 *l.*, 20 *l.* and 70 *l.* (8·804 qts., 13·206 qts., 17·608 qts. and 61·627 qts.), were partly filled with petrol.

They were placed on hot bricks in Testing Chamber No. 3. The stoppers were removed.

Part b.—Four similar vessels, but not fitted with safety tubes, were placed in a similar position.

Log of Test No. 12.—*Part b.*—This test with the four unprotected vessels (R′, S′, T′, U′) was taken first and a blazing torch of wood-wool and petroleum was used, first to warm the vessels and then to ignite the vapour at the openings.

Three explosions resulted. Two were mild and the vessels only slightly distorted, the greater part of the force being expended through openings in each. In the case of the 70 *l.* vessel the explosion was more violent and one end was blown out. (*See Figs.* 10 and 11, p. 6.)

Part a.—This test with the four protected vessels (R, S, T, U) was then made under similar conditions, in two cases with no

esults and in the other two the vapour burnt at the openings, but there was no explosion.

Notes.—Part b.—Part b was repeated twice, first with five and then with six vessels of various capacities.

Three of the five exploded, two with moderate force and one only slightly.

Five of the six exploded with moderate force.

In all cases where explosions occurred the vessels were only slightly distorted.

GENERAL ARRANGEMENTS.

The tests were carried out according to the procedure laid down by the Executive for investigations of this description and was conducted by a Sub-Committee comprising :—

Mr. Horace S. Folker, F.A.I. (Vice-Pres. N.F.B.U.), *Directing Member.*
Mr. Ellis Marsland, District Surveyor.
Mr. James Sheppard, A.Inst.E.E. (Surveyor, North British and Mercantile Insurance Company).
Major Harvey, D.S.O., R.E. (War Office).
Mr. E. J. A. Fulkes (Surveyor, Royal Insurance Company).

Mr. A. H. Lister assisted the Sub-Committee on May 1st.

All members of the Sub-Committee were on duty on May 1st except Mr. James Sheppard. All members were on duty on May 29th except Major Harvey.

The Council was represented for the testing operations of May 1st and May 29th by :—

Sir Boverton Redwood, F.R.S.Ed., F.I.C. (Advisor on Petroleum to the Admiralty and the Home Office).

The Executive was represented for the testing operations of May 1st and May 29th by :—

Mr. Edwin O. Sachs, F.R.S.Ed. (*Chairman*).
Mr. Max Clarke, F.R.I.B.A.

and on May 29th by :—

Mr. J. Herbert Dyer (Senior Vice.-Pres. N.F.B.U.).
Mr. Percy Collins, F.S.S.

The Committee's Hon. Medical Officer, Surg.-Major Maitland Coffin, F.R.C.P., was in attendance on May 1st and2 9th.

The general body of members was represented for the testing operations of May 1st, 1907, by :—

Messrs. Wm. Eastman ; F. R. Farrow, F.R.I.B.A. ; Wm. Grellier, F.R.I.B.A. (District Surveyor) ; Louis T. Healy, A.Inst.E.E. (Royal Insurance Company) ; F. W. Hamilton, F.R.I.B.A. (District Surveyor) ; G. Hayles (Surveyor, Commercial Union Assurance Company) ; W. E. Markham ; R. P. Notley, F.R.I.B.A. (District Surveyor) ; Jos. Randall, A.M.Inst.C.E. ;

Percy E. Ridley, F.S.I., A.Inst E E.; Capt. J. H. Thomson (H.M. Chief Inspector of Explosives); Lieut. Sladen, R.N. (Divis Officer, London Fire Brigade);

and on May 29th, by:—

Messrs. S. G. Gamble, A.M.Inst.C.E. (Divisional Officer, London Fire Brigade); Capt. J. H. Thomson (H.M. Chief Inspector of Explosives).

Messrs. Cairns Patents, Ltd., were represented on May 1st, by—Messrs. J. Hubert Dormer; Col. Willoughby Wallace, C.M.G.; C. Roope-Williams; and on May 29th by—Messrs. J. Hubert Dormer; Col. Willoughby Wallace, C.M.G.

Messrs. Fabrik Explosionssicherer Gefässe were represented on May 1st and 29th by M. Greenwald.

The following visitors attended at the Testing Station, by special invitation of the Executive, during the testing operations of May 1st, 1907:—

Messrs. Arthur Ashbridge, F.R.I.B.A. (District Surveyor); Cecil Adler; R. Bochemuhl; R. Bird; Geo. Bullock (Union Fire Office); J. L. Bongard; D. R. Baker; Chas. B. Charlesworth; C. H. Colson, M.Inst.C.E. (Supt. Civil Engineer, Admiralty); F. Brereton Dixon; A. R. Dyer, A.M.Inst.C.E. (Assistant Divisional Officer, London Fire Brigade); John Hay; M. Lodge; C. K. Milbourne; Sidney Perks, F.R.I.B.A. (Surveyor, City of London); E. Rowden; C. R. Sawyer; J. F. Sherrin; Capt. Sewell, R.E.; Geo. J. Stubbings, Junr.; Capt. Vickers, R.E. (War Office); Capt. C. F. Wallace; H. Weber;

and on May 29th:—

Messrs. J. W. Cleland, M.P.; C. B. Charlesworth; T. Muir; Capt. Vickers, R.E. (War Office); H. Weber.

Signed,

For the Sub-Committee conducting the Tests:—
HORACE FOLKER.

For the General Testing Arrangements Sub-Committee:—
E. J. A. FULKES.

For the Executive:—
JAMES SHEPPARD.

Published by the Committee as directed by the Executive.

C. F. ADAMI
(*Assist. Secretary*).

Date—June 26th, 1907.

Verified a true copy of the Report ordered to be published.

ROSE, INNES, SON AND CRICK (*Solicitors*).

Date—July 12th. 1907.

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"RED BOOKS" OF THE BRITISH FIRE PREVENTION COMMITTEE.—No. 123.

Edited by the Executive.

365280

Fire Tests with Hydrants.

A HYDRANT

FITTED WITH

AN "ADAPTOR"

FOR

Automatically putting the Hydrant into Action,

MANUFACTURED BY

MESSRS. W. FEATHERSTONE & CO.,

ROCHESTER.

The Committee's Report.

LONDON, 1907.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(*Founded 1897—Incorporated 1899*).
1, WATERLOO PLACE, PALL MALL.

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Two Shillings and Sixpence.

365280

OBJECTS OF THE COMMITTEE.

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts, and translations.

To undertake such independent investigations and tests of materials, methods, and appliances as may be considered advisable.

The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.

The Committee is not responsible for the views of individual authors as expressed in Papers or Notes, but only for such observations as are formally issued on behalf of the Executive.

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CHARLES ADAMI, *Assistant Secretary.*

Figs. 4 *and* 5.—VIEWS SHEWING 2½ IN. HYDRANT FITTED WITH "ADAPTOR" READY FOR USE.

NOTE.

In places, such as public buildings, warehouses, hospitals, hotels, etc., where the employees and servants are on an emergency called upon to handle the fire appliances, the device, detailed in the following Report has considerable advantage over the screw down wheel valve ordinarily attached to a hydrant, as by the mere pulling or jerking of the hose after it has been run out, the hydrant is brought into play without the necessity of turning the wheel valve, which in inexperienced hands often gets jammed at the critical moment by being turned in the wrong direction.

The time in which the hydrant fitted with an "adaptor" can be brought into play is also expedited. This however does not show to so great advantage in the comparative tests here described, but it must be borne in mind that the tests with the ordinary hydrant fittings as compared with the "adaptors" were operated by experienced firemen used to running out hose and turning valves on and off.

ELLIS MARSLAND.

LONDON, S.W.,
September 3rd, 1907.

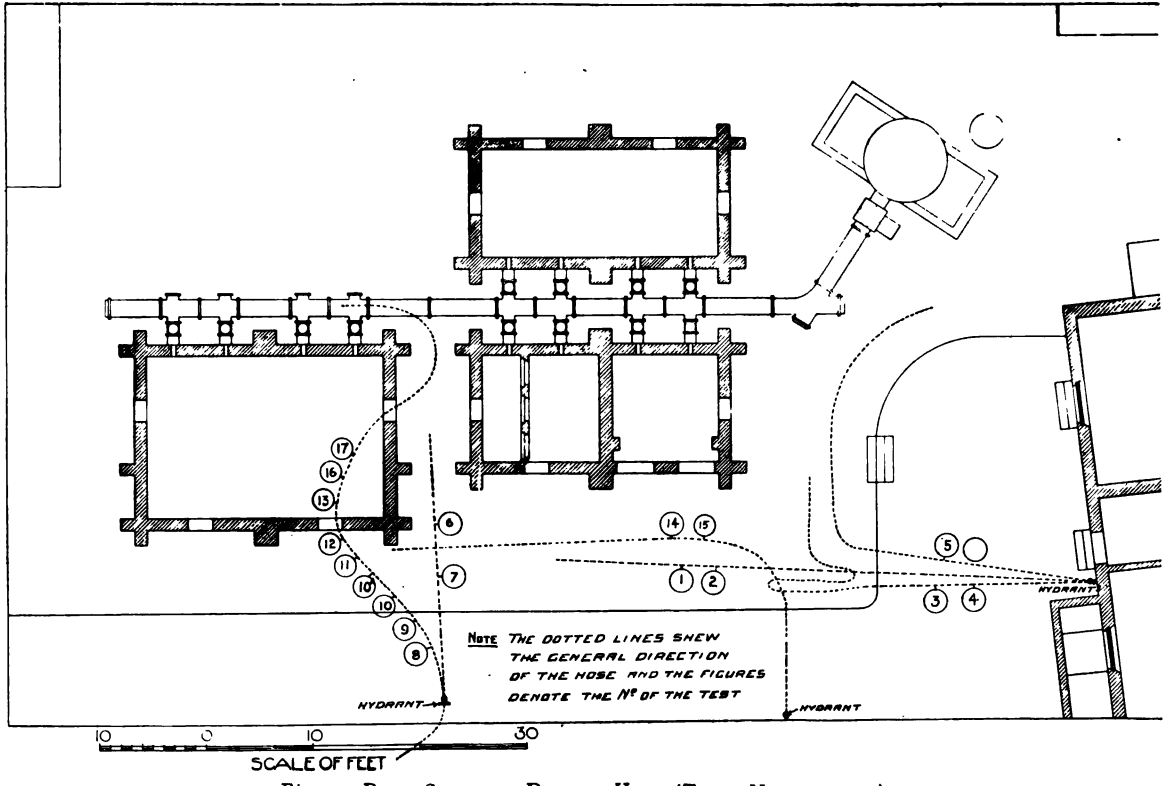
NOTE THE DOTTED LINES SHEW THE GENERAL DIRECTION OF THE HOSE AND THE FIGURES DENOTE THE Nº OF THE TEST
HYDRANT
HYDRANT
HYDRANT
10 0 10 30
SCALE OF FEET

Fig. 7. PLAN SHOWING RUN OF HOSE (TESTS NOS. 1 TO 17).

OFFICIAL REPORTS

OF THE

British Fire Prevention Committee

[FOUNDED 1897—INCORPORATED 1899].

FIRE TEST No. 89.—JUNE 27TH AND JULY 17TH, 1907.

A HYDRANT

FITTED WITH

AN "ADAPTOR"

FOR

Automatically putting the Hydrant into Action,

MANUFACTURED BY

MESSRS. W. FEATHERSTONE & CO.,

ROCHESTER.

OBJECT OF TEST.

To test an automatic adaptor, fitted to hydrant, and to record the effect of the adaptor in opening the hydrant.

Note.—Adaptors fitted to hydrants of 1 in. (·0254 *m.*) and of 2½ in. (·0635 *m.*) diameters were under test.

Note.—Canvas hose (with the usual screw couplings) was used, the hose being rolled or flaked and fitted with branch at outer end, and placed in position.

Note.—For purposes of comparison the hydrants were tested without the adaptor being put into action.

SUMMARY OF EFFECT.

The hydrant adaptors in each case were found to open the valves when the hose was pulled, irrespective of distance, direction, and run of hose, and in the major number of the tests it was found that water could be obtained at the branch more rapidly when the valve was opened by the adaptor than when

the ordinary screw down valve was opened after the hose was run out.

TABULATED SUMMARY OF TESTS.

THE 1 IN. HYDRANT.

With 1 in. (·0254 *m.*) Hydrant.	Test No. 1	Test No. 2	Test No. 3	Test No. 4	Test No. 5	Test No. 14	*Test No. 15*
Fitted with or *without* adaptor	With	With	With	With	With	With	*Without*
Length of hose in feet ..	50	50	50	50	50	50	*50*
Number of lengths coupled up ..	2	2	2	2	2	2	*2*
Dry or wet	Dry	Wet	Wet	Wet	Dry	Dry	*Dry*
Run out by nominee of Committee or Testor	T.	C.	T.	C.	C.	T.	*C.*
Run out straight or short or at an angle	Straight	Straight	Short	Short	Angle	Angle	*Angle*
Number of seconds in striking object	21⅛	18⅛	25	30	42⅜	23	*32*

THE 2½ IN. HYDRANT.

With 2½ in. (·0635 *m.*) Hydrant.	Test No. 6	*Test No. 7*	Test No. 8	*Test No. 9*	Test No. 10	*Test No.10a*
Fitted with or *without* adaptor	With	*Without*	With	*Without*	With	*Without*
Length of hose in feet	25	*25*	50	*50*	50	*50*
Number of lengths coupled up ..	1	*1*	2	*2*	2	*2*
Dry or wet	Dry	*Wet*	Dry	*Wet*	Wet	*Wet*
Run out by nominee of Committee or Testor	T.	*C.*	T.	*T.*	C.	*C.*
Run out straight or short or at an angle	Straight	*Straight*	Angle	*Angle*	Angle	*Angle*
Number of seconds in striking object	15	*14⅜*	42⅜	*50*	34	*63*

With 2½ in. (·0635 *m.*) Hydrant	Test No. 11	*Test No. 12*	*Test No. 13*	Test No. 16	*Test No. 17*
Fitted with or *without* adaptor	With	*Without*	*Without*	With	*Without*
Length of hose in feet	50	*50*	*50*	50	*50*
Number of lengths coupled up	2	*2*	*2*	1	*1*
Dry or wet	Dry	*Dry*	*Dry*	*Dry*	*Dry*
Run out by nominee of Committee or Testor	T.	*C.*	*C.*	T.	*C.*
Run out straight or short or at an angle	Angle	*Angle*	*Angle*	Angle	*Angle*
Number of seconds in striking object	29	*35*	*29*	19⅜	*25⅜*

Note.—The words and figures in *italics* indicate the tests where the adaptors were not in use.

Note.—25 ft. = 7·62 *m.*; 50 ft. = 15·24 *m.*

DESCRIPTION OF ADAPTOR.

(*See Figs.* 1, 2, 3, 4, 5, *and* 6.)

The adaptor is a device, whereby any fire hydrant, cock or tap, may be made automatic in action, enabling an operator, by simply grasping the branch pipe of hose fitted to the attachment, and running with it to the scene of a fire, to have at hand a supply of water without the necessity of unscrewing the valve in the ordinary manner.

Fig. 1 shows a side elevation of the adaptor, fitted to the cover of any valve, as indicated at A. Fig. 2 gives the design in plan, indicating at L the section of the branch pipe held in the clip R. Fig. 3 shows a front elevation, particularly the locking bar N in position.

The bridge-shaped casting (B), Fig. 1, forms the basis of the structure, and can be cast to suit various sizes of fire hydrants.

Before fitting to cover (A) of valve, the spindle (P) is removed, the thread turned off, and the spindle cut to requirements.

The boss of bridge (B) is bored and tapped to receive the new spindle (F) shown in Fig. 1, the hand wheel of valve being fitted on this spindle. A cross bar (D) is hinged to bridge at (S), and rests on cut spindle (P) of valve. Guide bars (H) are cast with bridge (D) to ensure a straight pull on automatic link (C) as it is carried away in any direction in action. The link (C) is hinged to base of bridge (as shown), and the free end passed over cross bar (D). The free end of link (C) is fitted with a set screw (G) to give the necessary tension on valve spindle to overcome the maximum pressure per square inch of water under the valve, and the set screw is finally secured by a lock nut. The link (C) is also fitted with a leather loop, through which the hose is threaded. The hose for apparatus is screwed to nozzle of cock at one end, the other end being fitted with a branch pipe, held in clip (R), Fig. 2.

The hose may be either coiled or flaked and may be placed in any convenient position near valve. To prevent any possibility of link (C) being pulled down when not required, accidentally or otherwise, the clip (R) holding the branch pipe is made to serve the purpose of a locking device. Only one jaw of this clip is movable, the other jaw being cast with bridge (B) on bracket (H)), and this jaw working on centre (T) connected with locking bar (N) prevents link (C) from being pulled down, when branch pipe is in clip (R). A spring (E) is fitted to end of movable jaw of clip (R), the other end being secured to bracket (H), Fig. 2. On releasing branch pipe from clip (R), the locking bar (N) is thrown out of position, and link (C) is clear and ready for action.

As soon as the branch pipe is released and hose run out, the final jerk is sufficient to pull down link (C), and the unbalanced water pressure will open the valve, and flow through the hose. When the requirements are over, the operator can readily shut off the water by screwing down the new spindle (F) by the hand wheel, replace the link (C) in position over cross-bar (D), screw down the spindle, and the valve is again automatic, ready for use.

Figs. 4, 5, and 6 are from photographs, and show the hydrants fitted with adaptors ready for use.

PREPARATIONS FOR TESTS.

The adaptors were fitted to 1 in. (·0254 *m.*) and 2½ in. (·0635 *m.*) hydrant valves. The water supply for the 1 in. (·0254 *m.*) hydrant was from the ordinary mains of the Com-

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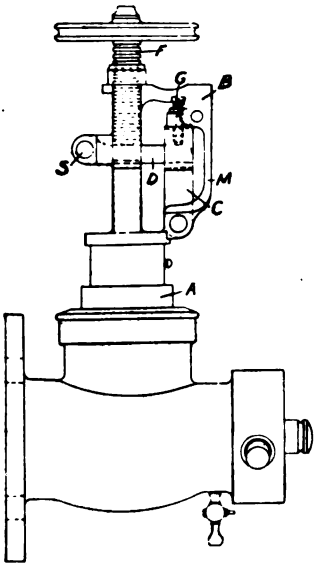

Fig. 1. SIDE ELEVATION.

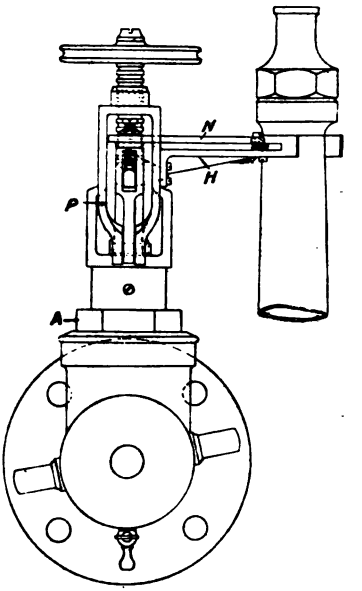

Fig. 3. FRONT ELEVATION.

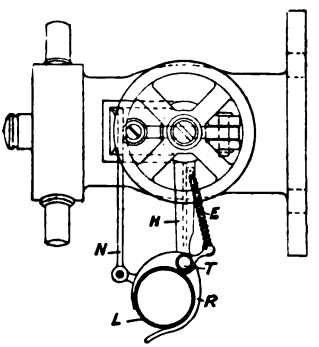

Fig. 2. PLAN.

DIAGRAMMATIC ILLUSTRATION
OF
"ADAPTOR."
(*See page* 9.)

mittee's water supply, which during the tests registered a varying pressure from 8 to 25 lbs. per square 1 in. (·53 to 1·7 *atms.*).

The water supply for the 2½ in. (·0635 *m.*) valve was from the water main 30 ft. distant, on which there was a pressure varying from 40 lbs. (2·72 *atms.*) to 45 lbs. per square inch (3·06 *atms.*)

The hose used was 1 in. (·0254 *m.*) and 2 in. (·0635 *m.*) canvas hose, with L.F.B. couplings.

For position of hydrants and run of hose, see Fig. 7.

LOG OF THE TESTS.

On Thursday, June 27th, and Wednesday, July 17th, 1907, the tests were undertaken.

The tests were made at the Committee's Testing Station at Regent's Park, in the open.

The following is a log of the tests :—

TEST No. 1.

With 1 in. (·0254 *m.*) hydrant connected to 1 in. (·0254 *m.*) water main at the station fitted with 1 in. (·0254 *m.*) adaptor, to which was attached two 25 ft. (7.62 *m.*) lengths of 1 in. (·0254 *m.*) canvas hose with a 1 in. (·0254 *m.*) branch, having a $\frac{3}{16}$in. (·0047 *m.*) nozzle. The water pressure being 24 lbs per square inch (1·6 *atms.*)

The dry hose was run out in a direct line to the full length by a nominee of the testor in 10 seconds, and the valve opened by the hose being pulled. The water from the branch struck the object in 21$\frac{4}{5}$ seconds.

TEST No. 2.

With the same hydrant as above.

The wet hose was run out in a direct line to the full length by a nominee of the Committee in 10 secs. and the valve opened by the hose being pulled. The water from the branch struck the object in 18$\frac{4}{5}$ seconds.

TEST No. 3.

With the same hydrant as above.

The wet hose was to be run out, but the object to be struck by the water was at a less distance than the full length of the hose.

The hose was run out by a nominee of the testor, and hose was pulled and the water from the branch struck the object in 25 seconds.

TEST No. 4.

With the same hydrant as above.

This was a similar test to No. 3, but the wet hose was run out by a nominee of the Committee, and the water struck the object in 30 seconds.

TEST No. 5.

With the same hydrant as above.

Two 25 ft. (7·62 *m.*) lengths of dry hose were run out to their full extent, but at an angle, by a nominee of the Committee to test the operation of the valve when pulled obliquely. The valve opened and the water struck the object in 42$\frac{2}{5}$ seconds.

COMPARATIVE TESTS.

HYDRANTS FITTED WITH ADAPTORS.

TEST No. 6.

With 2½ in. (·0635 *m.*) hydrant, fitted with a 2½ in. (·0635 *m.*) adaptor to which was attached a 25 ft. (7·62 *m.*) length of 2½ in. (·0635 *m.*) dry canvas hose with branch having a ¾ in. (·0190 *m.*) nozzle. The water was connected to the hydrant by 2½ in. (·0635 *m.*) canvas hose from the water main of the adjoining premises, the pressure being about 40 lb. per □ inch (*2·72 atms.*).

The dry hose was run out in a direct line to the full length by a nominee of the testor, the valve was opened by the hose being pulled.

The water from the branch struck the object in 15 seconds.

TEST No. 8.

With the same hydrant and adaptor as Test No. 6, but with two 25 ft. (7·62 *m.*) lengths of dry hose, coupled up with branch and nozzle as above.

The hose was run out obliquely by a nominee of the testor, through two doorways of Hut No. 3, and then round the S.E. angle of the same hut.

The operator pulled the hose to open the valve before starting to run with his hose; he then ran out his hose, the water following him.

The object was struck by the water in 42⅝ seconds.

TEST No. 10.

Test No. 8 was repeated, the wet hose being run out by a nominee of the Committee.

The hose was run out, but the operator did not pull the hose to open the valve until it was completely run out.

The object was struck by the water in 34 seconds.

HYDRANTS WITHOUT ADAPTORS.

TEST No. 7.

With 2½ in. (·0635 *m.*) hydrants, all as test No. 6, but *withont the adaptor.*

The dry hose was run out in a direct line to the full length by a nominee of the Committee. The operator ran back, opened the screw valve, and returned to the branch.

The object was struck by the water in 14⅜ seconds.

TEST No. 9.

With the same hydrant hose as Test No. 8, but *without the adaptor*, the hose being wet.

The hose was run out obliquely, all as Test No. 8, by a nominee of the testor.

The operator ran back, opened the screw valve and returned to his branch.

The object was struck by the water in 50 seconds.

TEST No. 10A.

With the same hydrant and hose all as Test No. 10, but *without the adaptor.*

The hose was run out by a nominee of the Committee. The operator ran back, opened the screw valve and returned to his branch.

The object was struck by the water in 63 seconds.

TEST No. 11.

With the same hydrant and adaptor as Test No. 8, but with two lengths of dry hose coupled up.

The hose was run out in the same direction as Test No. 8, by a nominee of the testor, who pulled the hose and opened the valve before the hose was completely run out; he then completed running out the hose.

The object was struck by the water in 29 seconds.

TEST No. 12.

With the same hydrant and hose, all as Test No. 11, but *without the adaptor.*

The hose was run out in the same direction as Test No. 11 by a nominee of the Committee.

The operator ran back, opened the screw valve, and returned to his branch.

The object was struck by the water in 35 seconds.

TEST No. 13.

Test No. 12 was repeated, the details being the same.

The object was struck by the water in 29 seconds.

TEST No. 14.

With a 1 in. (.0254 *m.*) hydrant, the same as Test No. 1, and two 25 ft. (7.619 *m.*) lengths of 1 in. (.0254 *m.*) dry hose coupled up. The hose was run out by a nominee of the testor at an angle, and the valve opened by the hose being pulled.

The object was struck by the water in 23 seconds.

TEST No. 15.

This test was with a 1 in. (.0254 *m.*) hydrant, similar to Test No. 1, but *without the adaptor.*

Two 25 ft. (7.618 *m.*) lengths of 1 in. (.0254 *m.*) dry hose were used. The hose was run out at an angle by a nominee of the Committee. The operator ran back and opened the screw valve and returned to his branch.

The object was struck by the water in 32 seconds.

TEST No. 16.

With the same hydrant and adaptor as Test No. 8, but with one length of 50 ft. (15.24 *m.*) dry hose.

The hose was run out in the same direction as Test No. 8, by a nominee of the testor, who pulled the hose and opened the valve.

The object was struck by the water in 19⅞ seconds.

TEST No. 17.

With the same hydrant and hose, all as Test No. 16, but *without the adaptor.*

The hose was run out in the same direction as Test No. 16 by a nominee of the Committee. The operator ran back, opened the screw valve, and returned to his branch.

The object was struck by the water in 25⅞ seconds.

GENERAL ARRANGEMENTS.

The tests were carried out according to the procedure laid down by the Executive for investigations of this description, and were conducted by a Sub-Committee of the Executive comprising:

Ellis Marsland, District Surveyor, *Directing Member.*
James Sheppard, A.Inst.E.E. (Surveyor, North British and Mercantile Insurance Company).
J. Herbert Dyer (Senior Vice-Pres., Nat. Fire Brigades' Union).
J.W. Restler, M.Inst.C.E. (Dep.Chf. Eng., Metropolitan Water Board).
Jos. Randall, A.M.Inst.C.E.

NOTE.—All the members of the Sub-Committee except Mr. Dyer were on duty on June 27th, 1907, and all except Mr. Restler on July 17th.

Mr. A. H. Lister assisted the Sub-Committee on June 27th and July 17th, 1907.

The Council was represented for the testing operations of June 27th, 1907, by :—

Sir Henry Tanner, I.S.O. (Principal Architect H.M. Office of Works).
Sir James Williamson, C.B. (Late Director of H.M. Dockyard).

The Executive was represented for the testing operations by :—

Mr. Edwin O. Sachs, F.R.S.Ed., *Chairman.*
Mr. Max Clarke, F.R.I.B.A.
Mr. Percy Collins, J.P., F.S.S.

NOTE.—Mr. Sachs attended on June 27th and July 17th and Messrs. Clarke and Collins on July 17th.

The Committee's Hon. Medical Officer, Surgeon-Major Maitland Coffin, F.R.C.P., was in attendance on June 27th and July 17th, 1907.

The general body of members were represented for the testing operations of June 27th, 1907, by :—

Messrs. T. W. Aldwinckle, F.R.I.B.A.; S. Flint Clarkson, F.R.I.B.A. (Dist. Surveyor); Walter Dewes; W. Eastman; E. J. A. Fulkes (Surveyor, Royal Insurance Co.); Wm. Grellier, F.R.I.B.A. (District Surveyor); Matt. Garbutt, F.R.I.B.A.; Louis T. Healy, A.Inst.E.E. (Royal Insurance Co.); Harry King (Surveyor, Royal Exchange Assurance Co,); Percy Ridley, F.S.I., A.Inst.E.E.; Lieut. S. Sladen, R.N. (Divis. Officer, London Fire Brigade); F. Sumner, M.Inst.C.E. (City Engineer, City of London).

The general body of members were represented for the testing operations of July 17th, 1907, by :—

Messrs. William Grellier, F.R.I.B.A. (Dist. Surveyor); Matt. Garbutt, F.R.I.B.A.; S. G. Gamble, A.M.Inst.C.E.

(Divis. Officer, London Fire Brigade); Louis T. Healy, A.Inst. E.E. (Royal Insurance Co.); R. O. Wynne-Roberts, M.Inst. C.E.; Lieut. S. Sladen, R.N. (Divis. Officer, London Fire Brigade); Supt. J. Woollard (C.O., Ilford Fire Brigade).

Messrs. W. Featherstone and Co. were represented on June 27th and July 17th, 1907, by Messrs. W. Featherstone; S. C. Lambert; and Charles H. Polden; and on July 17th also by Mr. W. C. H. Maniece.

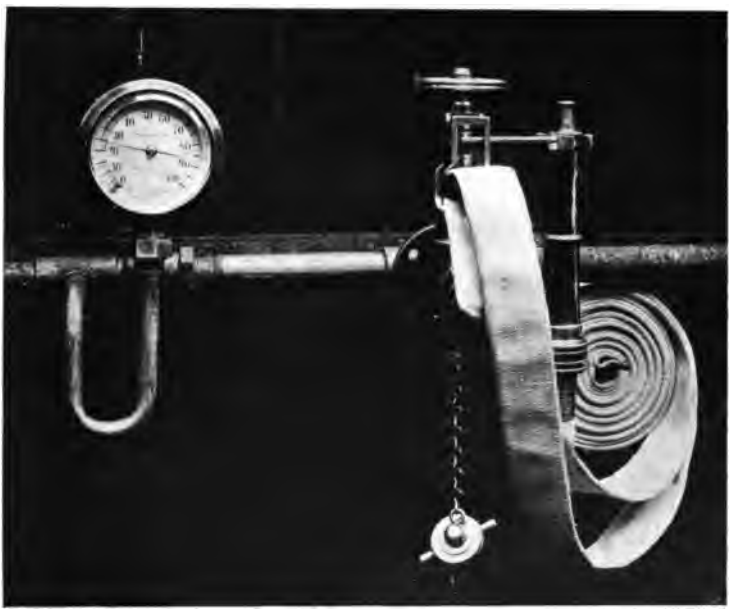

Fig. 6. VIEW SHEWING ONE-INCH HYDRANT FITTED WITH ADAPTOR READY FOR USE.

The following visitors attended at the Testing Station, by special invitation of the Executive during the testing operations of June 27th, 1907 :—

Messrs. T. W. S. Amerson; Harold H. D. Anderson; W. H. A. Berry; Herbert C. Berry; C. H. Colson, M.I.C.E. (Supt. Civil Engineer, Director of Works Dept., Admiralty); Chas. H. Freeman, A. A. Fillary (Dist. Surveyor); B. G. Fabian (Hand-in-Hand Fire Office); R. Henderson; R. D. Hansom (Dist. Surveyor); Walter K. Hatrell; W. J. Hardcastle, F.R.I.B.A.; T. B. Johnson (General Post Office); H. Lambert; H. Margesson; Capt. Handling (War Office);

F. Melhuish; W. Partridge (Central Electric Supply Co.); W. Herbert Rodgers (Deputy Dist. Surveyor); W. A. Rees (Surveyor, Liverpool and London and Globe Insurance Co.); Oliver A. Richardson (Surveyor, Sun Insurance Office); T. Osborn Smith; F. F. Smith; F. G. Stubbings (G.E. Railway); Capt. Tiddulph (War Office); Capt. Vickers, R.E. (War Office); E. A. Wilson (Eng. Dept., G.E. Railway); T. Watson; and deputy for Mr. J. C. Stransom (Architects' Dept., London County Council);

and during the testing operations of July 17th, by :—

Messrs. T. R. Brooke; G. H. Betjeman; F. Baxter; G. T. Bullock (Union Fire Office); Chas. T. Antler; F. H. Cann; the Rev. Canon R. Duckworth, D.D., C.V.O. (Westminster Abbey); Chas. H. Freeman; R. Henderson; A. J. Ivory (Anglo-American Oil Co.); S. Marsland; W. F. Mandling; C. P. Murrain; S. A. Pollock (General Post Office); Oliver A. Richardson (Surveyor, Sun Insurance Office).

Signed,

For the Sub-Committee conducting the Tests :—
ELLIS MARSLAND, *Directing Member.*

For the General Testing Arrangements Sub-Committee :—
JAMES SHEPPARD.

For the Executive :—
J. HERBERT DYER.

Published by the Committee as directed by the Executive.

C. F. ADAMI
(*Assist. Secretary*).

Date—September 2nd, 1907.

Verified a true copy of the Report ordered to be published.

ROSE, INNES, SON AND CRICK (*Solicitors*).

Date—September 10th, 1907.

Lists of the Committee's Publications, Contents of the Committee's Journal, etc., are obtainable upon application to the Assistant Secretary, 1, Waterloo Place, Pall Mall, London, S.W.

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"RED BOOKS" OF THE BRITISH FIRE PREVENTION COMMITTEE.—No. 124.

Edited by the Executive.

366287

FIRE TESTS

WITH

FIRE EXTINGUISHERS.

FIRE EXTINGUISHERS

Known as the "New Era" Extinguishers,

SUBMITTED FOR TEST BY

MESSRS. THE VALOR COMPANY, LIMITED,

ASTON CROSS, BIRMINGHAM, and LONDON.

The Committee's Report.

LONDON, 1907.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(Founded 1897—Incorporated 1899).
7, WATERLOO PLACE, PALL MALL.

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BRITISH FIRE PREVENTION COMMITTEE.—No. 124.

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Two Shillings and Sixpence.

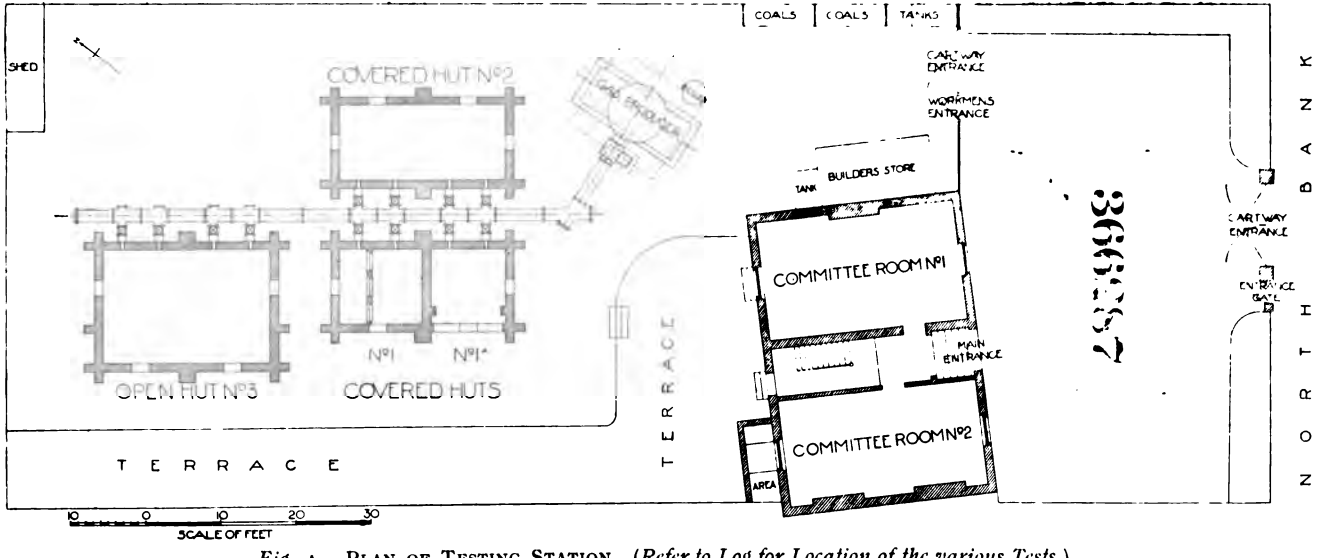

Fig. A. PLAN OF TESTING STATION. (*Refer to Log for Location of the various Tests.*)

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CHARLES ADAMI, *Assistant Secretary.*

Fig. 1. TEST NO. 1 (*View before Test*).

Fig. 2. TEST NO. 1 (*View after Test*).

(*See page* 14.)

NOTE.

The series of tests with the "New Era" chemical fire extinguisher again showed that hand chemical fire extinguishers, as a class, can often be employed with advantage in the incipient stages of small fires. If a small fire has obtained such proportions that it cannot be extinguished, a chemical fire extinguisher might still keep it in check until larger appliances can be brought into play—this applies especially to loose material.

The various tests undertaken with petrol would point to the conclusion that, with a volatile liquid, giving off such an inflammable vapour as this does, the extinguisher may be of use in putting out the fire, but only when under confined conditions. It was in effect proved to be so when handled with skill, and when the exposed surface of the petrol was not more than 2 sup. ft., or when the side of the vessel was slanting, so as to enable the liquid and gas from the extinguisher in the one case to form a curtain and stop combustion, and in the other case to be directed down the slant and thus lift the flames from the liquid as the operator progressed with it along the surface.

Chemical first-aid appliances should be examined and tested periodically and care should be taken that the hole of the nozzle is always kept clear.

PERCY COLLINS.

1, WATERLOO PLACE,
LONDON, S.W.
November 20th, 1907.

Figs. 6 *to* 8. TEST NO. 5. *Views at various stages of Test.* (*See page* 17.)

OFFICIAL REPORTS

OF THE

British Fire Prevention Committee

[FOUNDED 1897—INCORPORATED 1899].

FIRE TEST No. 92.—JULY 17TH, SEPTEMBER 4TH, AND OCTOBER 15TH, 1907.

FIRE EXTINGUISHERS

KNOWN AS THE

"NEW ERA" EXTINGUISHERS

SUBMITTED FOR TEST BY

MESSRS. THE VALOR COMPANY, LIMITED,

ASTON CROSS, BIRMINGHAM, AND LONDON.

OBJECT OF TESTS.

To ascertain the effect of the application of "New Era" Fire Extinguisher (supplied by the testor) upon various burning materials both in a room and in the open.

Note.—The tests comprised tests ordered by the Committee, "demonstration" tests undertaken at the request of the testor, and supplementary tests ordered by the Committee.

The tests were in certain instances followed by *re-tests*, ordered by the Committee.

Note.—Tests A, A2 to A7, B, and C were "demonstration" tests undertaken at the request of the testor.

In the case of test B a great blaze of flame was obtained from liquids of a volatile character, the fire having but little body.

The "demonstration" tests should not be looked upon as practical.

Supplementary tests A1, A8 to A 11, B1, B2 and C1 were undertaken by order of the Committee.

The following tests were applied :—

THE TESTS APPLIED.

The Committee's Tests.

TEST No. 1.—This test was undertaken to note the effect of the extinguisher upon a fire which was started at a dressing table in a bed-room with curtains, etc., above, the dressing table being draped with loose material and having inflammable articles lying thereon.

TEST NO. 2.—This test was undertaken to note the effect of the extinguisher upon hay in a raised wooden rack in a stable.

TEST NO. 3.—This test was undertaken to note the effect of the extinguisher upon a burning crate of loose wood-wool, such as might be found in a packing room of a wholesale or retail store.

TEST NO. 4.—This test was undertaken to note the effect of the extinguisher upon a stack of 12 empty packing cases, stacked against a wall, open face outwards and each containing a small quantity of inflammable material such as would be used for packing.

TEST NO. 5.—This test was undertaken to note the effect of the extinguisher upon a pyramidical stack of wood with wood-wool filled in.

Re-test No. 5A.—This was a re-test of No. 5 by order of the Committee.

TEST NO. 6—This test was undertaken to note the effect of the extinguisher upon a burning heap of straw and small pieces of soft wood damped with water.

TEST NO. 6A.—This was a re-test of No. 6 by order of the Committee.

TEST NO. 7.—This test was undertaken to note the effect of the extinguisher upon burning celluloid.

TEST NO. 8.—This test was undertaken to note the effect of the extinguisher upon burning logs, the fire being fed by laths and wood-wool.

Re-tests Nos. 8A and 8B.—These were re-tests of No. 8 by order of the Committee.

TEST NO. 9.—This test was undertaken to note the effect of the extinguisher upon burning petrol vapour.

Re-tests Nos. 9A, 9B, and 9C.—(By order of the Committee).—These were re-tests of No. 9, by order of the Committee.

TEST NO. 10.—This test was undertaken to note the effect of the extinguisher upon a burning heap of loose rubbish composed of wood-wool, shavings, hay, straw, waste paper and cotton rags.

TEST NO. 11.—This test was arranged to note the effect of the extinguisher upon a bonfire composed of hay, straw, wood-wool and shavings when in an exposed condition.

TEST NO. 12.—This test was undertaken to note the effect of the extinguisher upon a series of burning heaps of oily rags and dirty cotton waste.

THE TESTOR'S "DEMONSTRATION" TESTS AND *The "Supplementary" Tests.*

TESTOR'S DEMONSTRATION TEST A.—This demonstration test was undertaken by the testor to exhibit the effect of the extinguisher on petrol in an ordinary bucket.

TESTOR'S DEMONSTRATION TESTS A2 to A7.—These demonstrations were undertaken to show the effect of the extinguisher upon burning petrol vapour in small vessels of varying area, depth, and special section.

"SUPPLEMENTARY" TESTS A1, A8 to A11.—(By order of the Committee.)—The "Supplementary" tests were undertaken to note the effect of the extinguisher upon petrol when in vessels of varying area, depth and special section.

TESTOR'S DEMONSTRATION TEST B.—This demonstration test was undertaken by the testor to exhibit the effect of the extinguisher on a structure 5 ft. long by 9 ft. high at front (1·524 *m.* by 2·743 *m.*), 8 ft. high (2·438 *m.*) at back, by 3 ft. (0·914*m.*) deep, filled wth cross stays and a small quantity of wood-wool. The whole was tarred well all over, 3 gallons (13·630 *l.*) of petroleum and 1 gallon of petrol (4·543 *l.*) were sprayed over the inner side and the contents of the structure immediately before the test.

"SUPPLEMENTARY" TEST B1.—(By order of the Committee.)—This "Supplementary" test was undertaken with two similar sheds for purposes of comparison; no volatile spirit was used. The sheds were not tarred.

TESTOR'S DEMONSTRATION TEST C.—This demonstration test was undertaken by the testor to exhibit the effect of the extinguisher upon petrol spread over a wood floor.

"SUPPLEMENTARY" TEST C1.—(By order of the Committee.)—This "Supplementary" test was undertaken to note the effect of the extinguisher upon burning petrol vapour.

Note.—In tests Nos. 4, 5A, 6, 8A, 9, 9B, 12, A1, the extinguishers were applied by nominees of the Committee, who were selected promiscuously from amongst members, visitors, and staff, who were requested to apply the extinguishers to the best of their ability. In all other tests the extinguishers were applied by a nominee of the testor, who was thoroughly conversant with the use of the appliances and had had experience of the testors' previous "demonstration" tests and displays.

SUMMARY OF THE TESTS.

The following is a summary of the results of the tests ordered by the Committee:—

The tests demonstrated that the extinguishers brought into action were uniformly efficient in checking small fires in their early stages, whether applied by parties inexperienced in their use or by parties having expert knowledge of their application (*i.e.*, by nominees of the Committee or nominees of the testor).

In several instances one appliance more than sufficed to completely extinguish small fires.

Where the material ignited was soft and loose, some difficulty was apparent in stopping the smouldering which ensued, the flames, however, were kept in check and nearly extinguished.

Petrol fires were extinguished when the area of the spirit did not exceed that covered by the spray of the extinguisher, or in elongated vessels of limited width when the spray could be skilfully directed so as to lift the flames from the liquid as the operator progressed with it along the surface.

The following table summarises the number of extinguishers used, the time occupied in their application, the distance at which they were operated, and the effect noted :—

Test or Re-test.	Extinguishers. ⊏Large. (B)	*Small. (A)	Time occupied. min.	secs.	Distance of Operator. At first.	At end.	Remarks.
No. 1	—	1	1	49	12 ft. (3.657 *m.*)		Practically out in 1 min. 15 secs.
,, 2	—	3	3	55	12 ft.(3·657 *m.*)	at close qtrs.	Fire checked but broke out again and was put out eventually by 2 buckets of water.
,, 3	1	—	1	27	6 ft.(1·828 *m.*)	at close qtrs.	Fire checked, and after being raked over was extinguished by 2 pints of water.
,, 4	1	1	2	15	15 ft.(4·572 *m.*)	at close qtrs.	Fire out.
,, 5	1	—	0	36	at close	quarters.	Fire out.
,, 5A	1	—	1	55	at close	quarters	Fire checked, and eventually put out by a bucket of water.
,, 6	—	1	0	30	at close	quarters	Fire out.
,, 6A	—	1	0	38	at close	quarters	Fire out.
,, 7	—	1	0	20	6 ft.(1·828 *m.*)	at close qtrs.	Fire out.
,, 8	1	—	2	10	at close	quarters	Fire out.
,, 8A	1	—	1	54	at close	quarters	Fire out.
,, 8B	1	1	3	35	at close	quarters	Fire out.
,, 9	—	1	?	time	6 ft.(1·828 *m.*)	at close qtrs.	Fire out.
,, 9A	—	1	?	time	6 ft.(1·828 *m.*)	at close qtrs.	Fire out.
,, 9B	2	—	2	29	6 ft.(1·828 *m.*)	at close qtrs.	Fire out.
,, 9C	2	—	2	1	6 ft.(1·828 *m.*)	at close qtrs.	Fire out.**
,, 10	1	—	4	55	6 ft.(1·828 *m.*)	at close qtrs.	Fire out.
,, 11	2	—	3	41	13 ft.(3·962 *m.*)	at close qtrs.	Fire out.
,, 12	2	—	3	30	6 ft.(1·828 *m.*)	at close qtrs.	Fire checked and eventually extinguished by water.

⊏ Large extinguishers contain 3 gall. (13·630 *l.*). * Small extinguishers contain 2 gall. (9·087 *l.*).
Tests marked with affix A, B, or C were re-tests.
** Fire was re-started, and again extinguished with remains of second extinguisher.

CONDITIONS OF TEST.

The following rules were laid down by the Executive and served as a guide for the tests :—

The tests will generally be taken in numerical order, subject to alteration by the directing member.

Tests will, where considered advisable by the Sub-Committee, be repeated at their discretion (known as re-tests).

The extinguisher will be applied at the desire of the Sub-Committee either by a member of the Committee or the testor, or by a nominee of either.

The Committee provide material for certain tests as may be directed by the Sub-Committee and the testor for the others, but the Sub-Committee may re-place the material provided by the testor by their own or use their own at re-tests.

The fire having been allowed to progress at the discretion of the directing member, the extinguisher will be applied from a position and at a distance pointed out by him, a time limit being set to each test at his discretion.

Directly the number of extinguishers specified have been used or the time limit has been reached, a whistle will be sounded and the test stopped, and any fire remaining will be extinguished otherwise than by extinguishers.

Directly a fire has been extinguished by an extinguisher, a whistle will be sounded and the test stopped.

The party extinguishing a fire must not touch the material under test except with the liquid from extinguisher, unless by direction of the directing member.

The contents of any extinguisher on the ground may be reserved for analysis, and any extinguisher or extinguishers reserved for examination.

The arrangements are subject to alteration by the directing member.

The testor may put forward four " Demonstration " tests for the cognisance of the Sub-Committee, making his own arrangements and providing his own materials, but the Sub-Committee shall if it considers advisable order these tests to be repeated or repeated with variations to serve as Counter-Demonstrations.

DESCRIPTION OF APPLIANCE.

(Taken from the Maker's Description.)

The apparatus consists of a cylindrical vessel made of specially prepared hard rolled copper or special sheet steel, coated with a preparation to ensure it from corrosion; soldered and riveted, and fitted with a rubber hose and brass nozzle and brass screw bung. The cylinder is fitted with a perforated metal cage, to contain the acid bottle. (*See Figs.* B and C.)

The testor states that the following models were under test:—

02 *Model*, made of steel (for general use),

Containing	2 gall. (9·087 *l.*)
Weight, unfilled	14 lbs. (6·350 *kg.*)
Weight filled	36 lbs. (16·329 *kg.*)

Measurement: height 22½ in., dia. 8 in. (0·571 *m.* and 0·203 *m.*)

This model when made of copper.

Weight, unfilled	12 lbs. (5·443 *kg.*)
Weight, filled	34 lbs. (15·422 *kg.*)

03 *Model* made of steel (for factories, dockyards, etc.),

Containing	3 galls. (13·630 *l.*)
Weight, unfilled	16¾ lbs. (7·598 *kg.*)
Weight, filled	49¾ lbs. (22·567 *kg.*)

Measurements: height 29¾ in., dia. 8 in. (0·018 *m.* and 0·203 *m.*)

This model when made of copper.

Weight, unfilled	.. .. ..	14 lbs. (6·350 *kg.*)
Weight, filled	.. .. ..	47 lbs. (21·319 *kg.*)

The charge in all cases comprised a charge of sulphuric acid in separate glass vessel. Soda was dissolved in the water.

Figs. B *and* C. THE APPLIANCE UNDER TEST.

EXAMINATION OF THE APPLIANCE.

The following extinguishers were tested for range and duration of action on October 15th, 1907.

A small extinguisher (charged on July 17th); range of action 30 ft. to 41 ft. (9·1436 *m.* to 12·4962 *m.*). Spray began to diminish in 10 secs. At 20 secs., spray reached 32 ft. 9·7531*m*). Exhausted in 1 min. 30 secs.

A small extinguisher (charged on October 14th) range of action 25 ft. to 39 ft. (7·6197 *m.* to 11·8867 *m.*). Spray began to diminish in 10 secs. At 30 secs. spray was 30 ft. (9·1436 *m.*) at 50 secs. it was 25 ft. (7·6197 *m.*). Exhausted in 1 min. 12 secs.

A large extinguisher (charged on July 17th); range of action 30 ft. to 43 ft. (9·1436 *m.* to 13·1058 *m.*). Exceptional spurt to extreme distance of 43 ft. (13·1058 *m.*). Spray began to diminish in 25 secs. At 30 secs. it was 35 ft. (10·6675 *m.*). At 65 secs., 35 ft. (10·6675 *m.*); at 1.27 secs., 30 ft. (9·1436 *m.*) and at 2 mins., 30 ft. (9·1436 *m.*). Exhaused in 2 min. 3 secs.

A large extinguisher (charged on October 14th); range of action 30 ft. to 46 ft. (9.144 *m.*) to 14·020 *m.*). Spurt to extreme extreme distance of 46 ft. (14·020 *m.*). Spray began to diminish in 30 secs. At 40 secs. it was 35 ft. (10·668*m.*). At 60 secs., 35 ft. (10·668 *m.*)., and at 1·32 secs., 35 ft. (10·668 *m.*). Exhausted in 1 min. 32 secs.

DESCRIPTION OF TESTING PLANT.

The tests were conducted at the Committee's Testing Station at North Bank, Regent's Park.

Of the tests, " demonstration " tests and " supplementary " tests (with their respectve re-tests), Nos. 5, 5A, 9, 9A 9B, 9C, 11, A A1 to A11, B, B1, C and C1 were undertaken in the open, and tests Nos. 1, 2, 3, 4, 5, 6, 7, 8, 8A, 8B, 10, 12, in the testing chambers of the Committee.

Testing Chambers Nos. 1, 1A, 2 and 3 were used.

Test No. 2 was undertaken in Hut No. 1; tests Nos. 3, 7 and 12 in Hut No. 1A; tests Nos. 1, 6, 6A, and 10 in Hut No. 2; and tests Nos. 4, 8, 8A, and 8B, in Hut No. 3. Of the tests in the open, test No. 11 was taken on the top of Hut No. 1A.

Testing Chamber No. 1 was a covered hut measuring 10 ft. by 10 ft. by 8 ft. high (3·048 by 3·048 by 3·048 by 2·438 *m.*) Testing chamber No. 1A was a covered hut with its front open and measured 10 ft. by 10 ft. by 8 ft. 11 in. (3·048 by 3·048 by 2·717 *m*). Testing Chamber No. 2 was a covered hut measuring 22 ft. 3 in., by 10 ft. by 8 ft. 3 in. (6·781 by 3·048 by 2·514 *m.*). Testing Chamber No. 3 was an open hut without roof, measuring 22 ft. 3 in. by 15 ft. floor surface (6·781 by 4·572 *m.*).

Note.—The materials for the Committee's tests were provided by the Committee and were of the ordinary description. Those used in the " demonstration " tests and " supplementary " tests were provided by the testor.

PREPARATION FOR AND CONDUCT OF THE TESTS.

The tests were undertaken on July 17th, September 4th, and October 15th, 1907. The weather on each testing day was fine.

The tests and re-tests undertaken on July 17th, were as follows:—Nos. 1, 2, 3, 4, 5, 5a, 6, 6A, 7, 8, 9, 10, 11, 12, the " demonstration " and " supplementary " tests A, A1, B, C, took place from 2.45 p.m. to 7.30 p.m.

The re-tests "demonstration" and "supplementary" tests undertaken on September 4th, 1907, were as follows:—

Nos. 8A, 8B, 9A, 9B, 9C, "demonstration" tests A2 to A7.

They took place from 4 p.m. to 6 p.m.

The "supplementary" tests undertaken on October 15th, 1907, were as follows:—

Nos. A8 to A11, B1.

They took place from 3 p.m. to 5 p.m.

All the extinguishers used were provided and charged by the testor. The majority were charged on the day of the tests or the day previously, but some used on September 4th and October 15th had been charged on July 17th.

The Directing Member of the Sub-Committee decided *ad hoc* immediately before the commencement of each test or re-test, whether a nominee of the testor or of the Committee should operate the appliances. The nominees of the testor were in every case members of his permanent staff; the nominees of the Committee were either members or officials of the Committee or visitors.

THE OBJECT OF CONDITIONS AND ARRANGEMENTS FOR THE TESTS, WITH THE LOG OF EACH TEST.

TEST No. 1.

Object of Test No. 1.—This test was undertaken to note the effect of the extinguisher upon a fire which was started at a dressing table in a bedroom with curtains, etc., above, the dressing table being draped with loose material and having inflammable articles lying thereon.

Arrangements for Test No. 1.—Against the south wall of Hut No. 2 was placed a small deal table which had a covering and valance of figured muslin. On the table were celluloid combs, boxes, and a hand glass. On the right of the table was a cane-seated chair, and on the left a similar chair and a wicker basket containing waste paper. Above the table was a wooden cornice with valance and pole, over which were hung two pairs of lace curtains with two paper fly-catchers. The wall at the back of the table and the two side walls for some few feet on either side were papered. (*See Fig* 1.)

Log of Test No. 1.—The waste paper in the basket was lighted, and the fire was allowed to burn for 45 secs.

The flames obtained a fair hold of the materials.

One small extinguisher was applied by a nominee of the testor who stood 12 ft. (3·657 *m.*) away.

The fire was nearly extinguished in 1 min. 15 secs., and wholly extinguished in 1 min. 49 secs.

The paper basket was partly burnt and most of the paper. The window curtains on left side and fly-catchers were consumed, and also one celluloid hair comb and one celluloid toilet box. The remainder were all more or less partly consumed or damaged. The paper on the wall was burnt about 3 ft. superficial (0·914 *m.*). (*See Fig* 2).

TEST No. 2.

Object of Test No. 2.—This test was undertaken to note the effect of the extinguisher upon hay in a raised wooden rack in a stable.

Arrangement for Test No. 2.—Opposite the door in west side of Hut No. 1, was placed a wooden erection to represent a hay rack in a stable. This rack was composed of light strips of wood, fixed 3 ft. 4 in. (0·483 *m.*) above the floor. It was 5 ft. 8 in (1·727 *m.*) long, 2 ft. 4 in. (0·711 *m.*) deep, and 3 ft. (0·914 *m.*) from back to front. The back and one end were formed by the brickwork of the hut; the front, bottom, and one end, of wood strips. Half a truss of hay was placed loosely in the rack. (*See Fig.* 3.)

Fig. 3. TEST No. 2 (*View before Test*).

Log of Test No. 2.—The hay was lighted at one point and allowed to burn for 1 min.

The flames obtained a good hold of the hay.

Three small extinguishers were applied by a nominee of the testor, who stood at first 12 ft. (3·657 *m.*) away, but afterwards went inside the hut and worked intermittently at close quarters.

In 3 min. 55 secs. the extinguishers were exhausted.

The flames were held in check, and at times apparently extinguished, but smouldering continued and fire broke out again and was eventually put out by two buckets of water.

TEST No. 3.

Object of Test No. 3.—This test was undertaken to note the effect of the extinguisher upon a burning crate of loose wood-

wool, such as might be found in a packing room of a wholesale or retail store.

Arrangements for Test No. 3.—A lightly made crate, composed of strips of wood and measuring 4 ft. by 3 ft. 3 in. by 1 ft. 10 in. (1·219 *m.* by 0·991 *m.* by 0·558 *m.*) deep, was loosely filled with wood-wool. The crate was raised about 5 in. (·127 *m.*) from the floor of Hut No. 1a, being stood on two concrete blocks.

Log of Test No. 3.—The fire was lighted in two places and allowed to burn for 52 secs.

The flames had obtained complete hold of the wood-wool, and had slightly charred the crate.

One large extinguisher was applied by a nominee of the testor who stood 6 ft. (1·828 *m.*) away for 38 secs., and thereupon worked at close quarters.

The extinguisher was exhausted in 1 min. 27 secs.

The fire was checked and after being slightly raked over was extinguished by about 2 pints (1·136 *l.*) of water.

TEST No. 4.

Object of Test No. 4.—This test was undertaken to note the effect of the extinguisher upon a stack of 12 empty packing cases stacked against a wall, open face outwards and each containing a small quantity of inflammable material such as would be used for packing.

Arrangements for Test No. 4.—Twelve wooden cases each measuring about 3 ft. (0·914 *m.*) square by 2 ft. deep (0·609 *m.*) were piled up against the north wall of Hut No. 3, facing south. Some small pieces of laths and a little wood-wool was strewn about inside the cases. The inside of each box had been tarred, and tar was sprinkled over the contents. (*See Fig.* 4.)

Log of Test No. 4.—The fire was lighted at two points and allowed to burn for 45 secs. The flames obtained a fair hold of the inside of most of the cases.

One large and one small extinguishers were used by a nominee of the Committee, first at 15 ft. (4·572 *m.*) away, and then at close quarters. The flames were practically subdued in 1 min. 40 secs., but were intermittently played on for another 35 secs.

Both extinguishers were exhausted.

The shavings and loose material in most of the cases were consumed and the interior much charred.

In the remaining cases the loose material was partly consumed and the interiors of the cases slightly charred.

A little smouldering was left between two of the cases but this soon died down and went out. (*See Fig.* 5.)

TEST No. 5.

Object of Test No. 5.—This test was undertaken to note the effect of the extinguisher upon a pyramidical stack of wood with wood-wool filled in.

Arrangements for Test No. 5.—A pyramidical stack of tarred wood was erected in the open, about 12 ft. (3·657 *m.*) high and about 6 ft. (1·828 *m.*) in diameter at base and filled in with some small pieces of wood, laths and wood-wool. (*See Fig.* 6.)

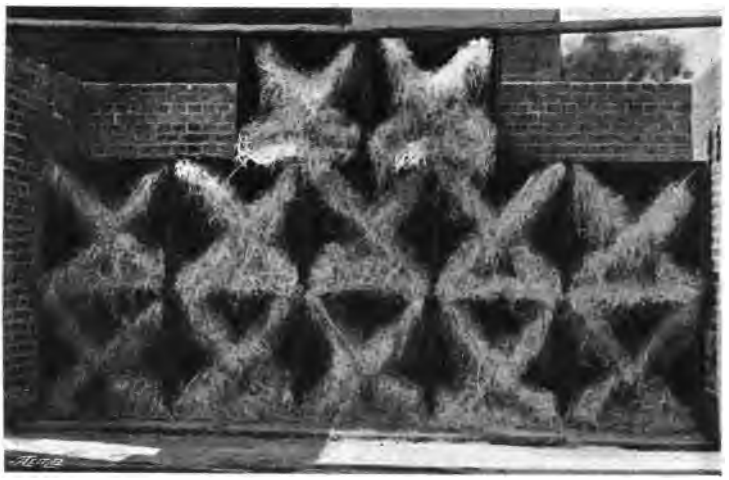

Fig. 4. TEST NO. 4 (*View before Test*).

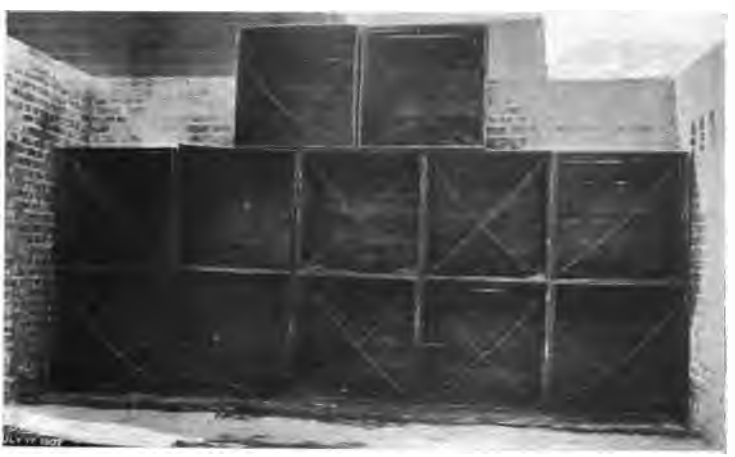

Fig. 5. TEST NO. 4 (*View after Test*).

Log of Test No. 5.—The fire was lighted at two points and allowed to progress for 1 min. 30 secs.

The flames obtained no practical hold upon the wood. (*See Figs. 7 and 8.*)

One large extinguisher was used by a nominee of the testor who applied it at close quarters all round the pyramid.

The fire was nearly extinguished in 30 secs., but two additional sprays of 5 to 6 secs. duration were applied.

All wood-wool and loose material was consumed and the wood slightly charred.

RE-TEST No. 5A.

Object of Re-Test No. 5a.—(By order of the Committee.) This was a *re-test* of Test No. 5.

Arrangements for Re-Test No. 5a.—The arrangements were practically identical with those for Test No. 5, the principal pieces of wood being re-used.

Log of Re-Test No. 5a.—The fire was lighted at two points and allowed to progress for 1 min. 26 secs.

The flames obtained a fair hold upon the wood.

One large extinguisher was used by a nominee of the Committee, who applied it at close quarters all round the pyramid.

The fire was extinguished in 1 min. 35 secs.

The fire was checked, but not completely extinguished. All the wood-wool was consumed and the wood charred. Smouldering continued for some time, and it was eventually extinguished by a bucket of water.

TEST No. 6.

Object of Test No. 6.—This test was undertaken to note the effect of the extinguisher upon a burning heap of straw and small pieces of soft wood damped with water.

Arrangements for Test No. 6.—A bushel of small pieces of soft wood was mixed with half a truss of straw and loosely stacked on floor of Hut No. 1, forming a heap about 2 ft. high (0·609 *m.*) and 4 ft. (1·219 *m.*) in diameter and one gallon (4·543 *l.*) of water sprinkled over same.

Log of Test No. 6.—The fire was lighted at one point and was allowed to progress for 2 mins.

The flames did not obtain a good hold of the straw.

One small extinguisher was applied by a nominee of the Committee at close quarters and the fire was extinguished in 30 secs.

RE-TEST No. 6A.

Object of Re-Test No. 6a.—(By order of the Committee.)—This was a *re-test* of Test No. 6.

Arrangements for Re-Test No. 6a.—The remaining material from the previous test was used with an additional amount of dry straw about equal to the quantity previously consumed.

Log of Re-Test No. 6a.—The fire was lighted at two points and was allowed to burn for 1 min. 30 secs.

The flames obtained a fairly good hold of the straw.

One small extinguisher was applied at close quarters by a nominee of the testor for 38 secs. and the fire was extinguished.

TEST No. 7.

Object of Test No. 7.—This test was undertaken to note the effect of the extinguisher upon burning celluloid.

Arrangements for Test No. 7.—A circular heap of celluloid shavings, scraps and dust, measuring about 2 ft. diameter by about 1 ft. high (0·609 *m.* by 0·305 *m.*) in the centre, was placed on the floor of Hut No. 1a.

Log of Test No. 7.—The fire was lighted at one point and allowed to burn for 5 secs. (*See Fig. 9.*)

Fig. 9. TEST No. 7 (*View during Test*).

The flames immediately obtained a good hold of the celluloid.

One small extinguisher was applied by a nominee of the testor standing 6 ft. (1·828 *m.*) away, and afterwards approaching to close quarters.

In 20 secs the fire was put out.

The extinguisher was not exhausted.

A quantity of the celluloid was not consumed, but was considerably damped by the contents of the extinguisher. It was scraped together and put into another heap 18 in. (0·457 *m.*) diameter and 2 in. (·051 *m.*) high, and set alight, when it burnt itself out.

TEST No. 8 AND RE-TESTS 8A, 8B.

Object of Test No. 8.—This test was undertaken to note the

Fig. 10. TEST 8A. *View before Test (South Side).*

Fig. 11. TEST 8A. *View after Test (North Side)*

effect of the extinguisher upon burning logs, the fire being fed by laths and wood-wool.

Arrangements for Test No. 8.—Twenty four logs of deal about 5 ft. (1·524 *m.*) in length, 4 in. by 3 in. (·102 by ·076 *m.*) were placed in a pile in Hut No. 3. Laths were placed between the logs. The interior was filled with laths and wood-wool loosely packed.

Log of Test No. 8.—The fire was lighted in two places and allowed to burn for 1 min. 45 secs.

The flames only attained a slight superficial hold of the logs.

One large extinguisher was applied by a nominee of the testor at close quarters.

The fire was extinguished with one extinguisher (used intermittently) in 2 min. 10 secs.

The extinguisher was exhausted.

All wood-wool was consumed and the laths partially so. The logs were charred on the surface.

Object of Re-tests Nos. 8A *and* 8B.—(By order of the Committee.) These were *re-tests* of Test No. 8.

Arrangements for Re-test No. 8A.—The arrangements were practically identical with those for Test No. 8, fresh logs being used. (*See Fig.* 10.)

Log of Re-test No. 8A.—The fire was lighted in two places and allowed to burn for 1 min. 45 secs. The flames obtained a fairly good hold of the logs. One large extinguisher was applied by a nominee of the Committee at close quarters. The fire was extinguished in 1 min. 54 secs., only half the extinguisher being used. All wood-wool was consumed, the laths almost entirely burned, the logs charred to a depth of $\frac{1}{8}$th of an inch. (*See Fig* 11.)

Arrangements for Re-test No. 8B.—The arrangements were practically identical with those for No. 8, the same logs being used, but the inside was well packed with wood-wool, laths and some pieces of soft wood.

Log of Re-test No. 8B.—The fire was lighted at two points, and allowed to burn for 1 min. 45 secs. A large extinguisher was applied at close quarters by a nominee of the testor and was exhausted in 1 min. 45 secs. After 7 secs., a small extinguisher was used and the fire was extinguished in altogether 3 mins. 35 secs. A second small extinguisher was only partly exhausted. A fair amount of wood-wool and soft wood remained.

TEST No. 9.

Object of Test No. 9.—This test was undertaken to note the effect of the extinguisher upon burning petrol vapour.

Arrangements for Test No. 9.—Three floor boards were placed together and fastened underneath by cross-battens, the joints were caulked, and a small rim (bead) was fastened around the outside of the boards. They measured 13 ft. long by 2 ft. 4 in wide (3·962 *m.* by 0·711 *m.*) The whole of the boards were first sprinkled with a pint (0·568 *l.*) of petrol, and then four further pints (2·272 *l.*) were poured on.

Log of Test No. 9.—The fire was lighted at one point. One small extinguisher was immediately applied by a nominee of the Committee, first at 6 ft. (1·828 *m.*) distance, and then at close quarters.

Some of the burning spirit was swept off the boards by the force of the extinguisher.

The flames were extinguished and it was found afterwards, when the lights were applied, that there was some petrol left both on the ground and on the boards. The extinguisher was not exhausted.

RE-TESTS Nos. 9A, 9B, AND 9C.

Object of Re-tests Nos. 9A, 9B *and* 9C. (By order of the Committee.)—These were *re-tests* of Test No. 9.

Fig. 12. TEST 9A. (*View during Extinguishing.*)

Arrangements for Re-tests No. 9A.—The arrangements were practically identical with those for Test No. 9.

Log of Re-test No. 9A.—The fire was lighted at one point. One small extinguisher was immediately applied by a nominee of the testor, first at 6 ft. (1·8 to 8 *m.*) distance and then at close quarters. Some of the burning spirit was swept off the boards by the force of the extinguisher. The flames were extinguished and a small amount of petrol was left both on the boards and on the ground. The extinguisher was not exhausted. (*See Fig.* 12.)

Arrangement for Re-test No. 9B.—The three floor boards, as used for Test No. 9, were utilised, but the rim round the sides

was raised to 7½ in. high, one end of the boards also being boarded to a height of about 3 ft. with a return either side about 2 ft. 3 in. About 3 gallons of petrol were distributed on the floor. (*See Fig.* 13.)

Log of Re-test No. 9B.—The fire was lighted at one point. A large extinguisher was immediately applied by a nominee of the Committee and the extinguisher was exhausted in 1 min. 40 secs., and a second extinguisher was afterwards applied. The fire was subdued in 2 mins. 29 secs., and upon examination a slight amount of petrol was found unconsumed.

Fig. 13. TEST 9B. (*Arrangement for Test.*)

Arrangements for Re-tests No. 9C.—These arrangements were identical with those of Test No. 9B.

Log of Re-test No. 9C.—The fire was lighted at one point. A large extinguisher was immediately applied by a nominee of the testor and was exhausted in 1 min. 40 secs. After an interval of 7 secs. a further large extinguisher was applied and the fire was put out in 2 mins. 1 sec. The fire was started again and put out with the remains of the second extinguisher and again upon being tested with a torch a little petrol remained.

TEST No. 10.

Object of Test No. 10.—This test was undertaken to note the effect of the extinguisher upon a burning heap of loose rubbish, composed of wood-wool, shavings, hay, straw, waste paper and cotton rags.

Arrangements for Test No. 10.—A heap of rubbish, composed of a quarter bale of wood-wool, half a sack of shavings, a quarter truss of hay, half a bundle of straw, one bushel of waste paper, and one bushel of clean and dry cotton rags were well mixed and loosely stacked on floor of No. 2 hut.

Log of Test No. 10.—The fire was lighted at two points and allowed to burn for 2 min.

The flames obtained a good hold of the material.

One large extinguisher was applied by a nominee of the testor, who started at 6 ft. (1·828 *m.*) distance.

The fire was slightly checked at this stage.

After one minute the operator raked the material over.

At the end of 4 min. 55 secs, the heap was left extinguished.

About two-thirds of the extinguisher were used.

TEST No. 11.

Object of Test No. 11.—This test was arranged to note the effect of the extinguisher upon a bonfire composed of hay, straw, wood-wool and shavings when in an exposed position.

Arrangements for Test No. 11.—A bonfire composed of a quarter truss of hay, half a truss of straw, a quarter bale of wood-wool, and half a sack of shavings well mixed was loosely piled on the roof of Hut No. 1a. The heap measured 6 ft. by 3 ft. 6 in. high, (1·828 *m.* by 1·067 *m.*)

Log of Test No. 11.—The fire was lighted at one point and allowed to burn for 1 min, A nominee of the testor stood on the ground, and at the end of this 1 min. went up the ladder on to the roof and commenced extinguishing operations.

He stood for the first minute at about 13 ft. (3·962 *m.*) distance, and afterwards went to close quarters.

The flames obtained a good hold of the material,

The fire was almost extinguished at the end of 2 min. 27 sec.

Two large extinguishers were applied and two-thirds of the second one remained.

The operator raked the material over after about 1 min., and finally put it out in 3 min. 41 secs.

TEST No. 12.

Object of Test No. 12.—This test was undertaken to note the effect of the extinguisher upon a series of burning heaps of oily rags and dirty cotton waste.

Arrangements for Test No. 12.—A series of six small heaps, each about 1 ft. by 1 ft. (0·3065 by 0·305 *m.*) high, of oily rags and dirty cotton waste were arranged on the floor of Hut No. 1a, and these were connected by trains of similar material soaked in spirit.

Log of Test No. 12.—The fire was lighted in two places and allowed to progress for 1 min. 30 secs.

The flames obtained good hold of all the heaps.

Two large extinguishers were operated by a nominee of the Committee, who stood first 6 ft. (1·828 *m.*) away, and then worked at close quarters.

The heaps were finally extinguished in 3 min. 30 secs., but smouldering continued for some considerable time after, and it was eventually extinguished by water. (*See Fig.* 14.)

TESTOR'S DEMONSTRATION TESTS A, A2 to A7.

Object of Demonstration A.—This Demonstration Test was undertaken by the testor to exhibit the effect of the extinguisher on petrol in an ordinary bucket.

About 1 inch (·025 *m.*) deep of petrol was placed in a common pail. A light was thrown in and the petrol vapour ignited.

Fig. 14. TEST NO. 12 (*View after Test*).

An extinguisher was applied by a nominee of the testor and sprayed over the top of the bucket. The flame was soon suffocated and died out.

Note.—The test was repeated with like result.

Object of Demonstrations A2 *to* A7. These demonstrations were undertaken to show the effect of the extinguisher upon burning petrol vapour in vessels of varying area, depth and section.

Arrangements for Demonstration A2.—A galvanised iron tank 18 in. diameter and 2 ft. deep was used in which was placed half a gallon of petrol.

Log of Demonstration A2.—The petrol vapour was ignited and one small extinguisher immediately used by a nominee of the testor. The fire was extinguished in 3 secs.

Arrangements for Demonstration A3.—The arrangements for this test were identical with No. A2.

Log of Demonstration A3.—The arrangements and result were identical with No. A2.

Fig. 15. DEMONSTRATION TEST A 6. (*View before Test.*)

Fig. 17. "SUPPLEMENTARY" TESTS A8 TO A11. (*The Vessels used.*)

Arrangements for Demonstration A4.—The same vessel was employed as for No. A2. Two gallons of petrol were poured in.

Log of Demonstration A4.—The vapour was ignited and a partly used extinguisher was employed and the flames were at once extinguished.

Arrangements for Demonstration A5.—The same vessel as for A2 was employed. Two gallons of petrol were placed in the tank, but all round the inside of the tank was well wetted with petrol.

Log of Demonstration A5.—The vapour was ignited and a partly used small extinguisher was applied and the fire was quenched in about 8 secs.

Arrangement for Demonstration A6.—A galvanised iron V-shaped trough, 2 ft. by 4 ft. (0·610 *m.* by 1·219 *m.*) by 18 in. (0·457 *m.*) deep, mitred at the angles so that the bottom of the V was 2 ft. long (c·610 *m.*) was placed on the ground in which was placed 2 gallons of petrol. (*See Fig.* 15.)

Log of Demonstration A6.—A lighted match was thrown on and one small extinguisher immediately applied by a nominee of the testor. The flames were quenched in 9 secs.

Note.—This test was immediately repeated with the same petrol, and the same extinguisher was used and the flames quenched in 4 secs.

Arrangements for Demonstration A7.—The V-shaped tank, as used in Test No. A6, was employed and 7 quarts of petrol placed inside. The sides of the tank inside were well wetted with petrol.

Log of Demonstration A7.—The vapour was ignited and a partly used extinguisher was employed by a nominee of the testor, and the fire was extinguished in 25 secs.

"SUPPLEMENTARY" TESTS A1, A8 TO A11.

Note.—This demonstration was ordered by the Committee but objected to by the Testor.

Object of Demonstration A1.—This test was undertaken to show the effect of the extinguisher upon a bath of petrol in shallow vessels.

Arrangements for "Supplementary" Test A1.—Two baking tins, about 1 ft. 6¼ in., 1 ft. 2 in. by 2⅝ in. deep (0·464 by 0·356 by each ·066 *m.*) were placed side by side and each contained petrol to the extent of 1½ in. (·038 *m.*) deep. The area of petrol was 2 ft. 2 in. by 1 ft. 4 in. (0·661 by 0·406 *m.*)

Log of "Supplementary" Test A1.—The petrol vapour was lighted and one large extinguisher was operated by a nominee of the Committee.

The flames were not extinguished and were eventually put out by sand.

Note.—The "supplementary" test was repeated, but only one tin was used, and after about 2 mins the flames were extinguished, a good deal of the petrol however having been forced out of the tin on to the ground by the action of the jet. Some unconsumed petrol was however left in the tin.

Arrangements for "Supplementary" Tests A8.—A galvanised iron tank 3 ft. by 3 ft. (0·9143 *m.* by 0·9143 *m.*) by 1 ft. 6 in. deep (0·4571 *m.*) was placed on the ground. 4 gallons (18·174 *l.*) were put in, the depth of petrol being about ¾ in. (·0190 *m.*). (*See Fig.* 17.)

Log of "Supplementary" Test A8.—A lighted match was thrown on to the surface of the petrol. Two large extinguishers were applied by a nominee of the testor. When the spray from the extinguishers spread over the surface of the petrol the force of the flames was at first slightly checked. The flames afterwards increased in fierceness. The first extinguisher which was immediately applied was exhausted in 1 min. 55 secs. The second in 2 mins. 5 secs. The flames were not extinguished. The petrol burnt itself out in 8 mins.

Arrangements for "Supplementary" Test A9.—A galvanised iron tank, 3 ft. by 3 ft. (0·9143 *m.* by 0·9143 *m.*) by 6½ in. deep (0·1651 *m.*) was placed on the ground. 4 gallons (18·174 *l.*) were put in, the depth of petrol being about ¾ in. (·0190 *m.*). (*See Fig.* 17.)

Log of "Supplementary" Test A9.—A lighted match was thrown on to the surface of the petrol. Two large extinguishers were applied. The flames gained in fierceness. The first extinguisher, which was immediately applied, was exhausted in 1 min. 55 secs. The second in 1 min. 58 secs. The flames were not extinguished. The flames were put out after 4 mins. 30 secs. with five wet sacks thrown on.

Arrangements for "Supplementary" Test A10.—A galvanised iron tank splayed at ends, 1 ft. 6 in. (0·4571 *m.*) wide, 2 ft. 11 in. long at top (0·8888 *m.*), and 1 ft. 5½ in. long at bottom (0·4444 *m.*), 1 ft. (0·3047 *m.*) deep, was placed, on the ground. 2 gallons (9·087 *l.*) of petrol were put in the depth of petrol being about 1½ in. (·0380 *m.*). (*See Fig.* 17.)

Log of "Supplementary" Test A10.—A lighted match was thrown on the surface of the petrol. Two small extinguishers followed by one large extinguisher were applied. The flames were not extinguished. The first extinguisher, which was immediately applied, was exhausted in 1 min., the second in 1 min. 10 secs., the third in 2 mins. 20 secs. After 5 mins. the flames were put out with four wet sacks thrown on.

Arrangements for "Supplementary" Test A11.—A galvanised iron tank, tapered at ends, 1 ft. 6 in. wide (0·4571 *m.*) 2 ft. 6 in. long at top and 1 ft. 5½ in. at bottom (0.7619 *m.* and 0·4444 *m.*), 8 in. (·2032 *m.*) deep, was placed on the ground. 1 quart (1·136 *l.*) of petrol was put in. (*See Fig.* 17.)

*Log of "Supplementary" Test A*11.—A lighted match was thrown on the surface of the petrol. One large extinguisher was immediately applied. The flames were extinguished in 18 secs. A quart (1·136 *l.*) of petrol was thereupon added and a match again applied. The same extinguisher was again used and the flames were extinguished in 19 secs.

TESTOR'S DEMONSTRATION TEST B.

Object of Demonstration B.—This Demonstration Test was undertaken by the testor to exhibit the effect of the extinguisher on a structure 5 ft. long by 9 ft. high at front, (1·524 by 2·743 *m.*)

Fig. 18. "SUPPLEMENTARY" TESTS B1. (*The Structures after fire.*)

8 ft. high (2·438 *m.*) at back by 3 ft. (0·914 *m.*) deep, filled with cross-stays and a small quantity of wood-wool. The whole was tarred well all over, 3 gallons (13·630 *l.*) of petroleum and one gallon (4·543 *l.*) of petrol were sprayed over the inner side and the contents of the structure immediately before the test.

Log of Demonstration B.—A match was thrown upon the floor of the structure and soon the whole of the interior was a mass of flame.

The flame practically obtained no hold either of the laths or the shelter before the extinguisher was applied.

One small extinguisher was applied by a nominee of the testor and the flames were extinguished—they had penetrated between the boards in places to the outside, but the operator easily extinguished them with the extinguisher.

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"SUPPLEMENTARY" TEST B1.

Arrangements for "Supplementary" Test B1.—(A comparative test by order of the Committee.)—Two similar sheds were erected and loosely packed with wood wool. No volatile spirit was used. The sheds were not tarred.

Log of "Supplementary" Test B1.—The wood wool in each shed was ignited simultaneously (at one point in each case).

The flames were allowed to burn for 20 secs.

Two large extinguishers were applied in succession on the one shed at close quarters.

The flames were extinguished in 2 mins. 14 secs. The second extinguisher was not exhausted.

Eight buckets of water (each of 11 quarts capacity, ¾ full), (12·494 *l.*) were applied on the second shed.

The fire was extinguished in 55 secs. (*See Fig.* 18.)

Fig. 16. "SUPPLEMENTARY" TEST C1. (*Board used before Test.*)

TESTOR'S DEMONSTRATION TEST C.

Object of Demonstration C.—This demonstration test was undertaken by the testor to exhibit the effect of the extinguisher upon petrol spread over a wood floor.

Arrangements for Demonstration C.—A wooden platform made of ordinary floor boards and battened below, measuring about 6 ft. by 6 ft, (1·828 by 1·828 *m.*) was placed on the ground, about 2 pints (1·136*l.*) of petrol poured on.

Log of Demonstration C.—The vapour was ignited by a match thrown on and one large extinguisher very soon applied. A good deal of the petrol was washed off the boards on to the ground and continued burning. The flames were, however, soon extinguished, and a very small quantity of petrol was found to be still unconsumed under the boards.

"SUPPLEMENTARY" TEST C1.

Object of "Supplementary" Test C1. (By order of the Committee.)—This demonstration was undertaken to show the effect of the extinguisher upon burning petrol vapour.

Arrangements for "Supplementary" Test C1.—A wooden floor, 5 ft. 7 in. by 5 ft. 7 in. (0·178 *m.* by 1·702 *m.*) with a small rim (B) fastened round 1 in. (0·025 *m.*) deep, was placed on the ground. Two gallons of petrol were poured on the floor. (*See Fig.* 16.)

Log of "Supplementary" Test C1.—The fire was lighted at one point. A small extinguisher was immediately applied by a nominee of the testor at close quarters. A quantity of the burning spirit was swept off the boards by the force of the extinguisher. The first extinguisher was used in 1 min. 40 secs. A second extinguisher was immediately brought into play, but was not exhausted, the fire was practically out in 2 mins. 20 secs., a part of the under side of the floor, however, still burning. Practically all the petrol was consumed.

GENERAL ARRANGEMENTS.

The tests were carried out according to the procedure laid down by the Executive for investigations of this description, and were conducted by a Sub-Committee of the Executive comprising :—

Messrs. Percy Collins, J.P., F.S.S. *Directing Member.*
Ellis Marsland (Dis. Surveyor), *Gen. Hon. Secretary.*
James Sheppard, A.Inst.E.E. (Surveyor North British and Mercantile Insurance Co.).
J. Herbert Dyer (Senior Vice. Pres. Nat. Fire Brigades Union).
H. S. Folker (Vice. Pres. Nat. Fire Brigades Union).
E. J. A. Fulkes (Surveyor, Royal Insurance Co.).
Capt. Henderson (Chief Officer Rickmansworth Fire Brigade).

Mr. A. H. Lister assisted the Sub-Committee.

Note.—The Sub-Committee attended in full on July 17th, and excepting Messrs. Sheppard and Folker on September 4th, and except Messrs. Folker and Henderson on October 15th.

The Executive was represented for the testing operations of July 17th, September 4th and October 15th by :—

Mr. Edwin O. Sachs, F.R.S.Ed., *Chairman.*

and on July 17th also by :—

Mr. Max Clarke, F.R.I.B.A.

The Committee's Hon. Medical Officer, Surgeon-Major Maitland Coffin, F.R.C.P., was in attendance on July 17th.

The general body of members was represented for the testing operations of July 17th, 1907, by :—

Messrs. William Grellier, F.R.I.B.A. (Dis. Surveyor) ; Matt. Garbutt, F.R.I.B.A. ; S. G. Gamble, A.Inst.C.E. (Divisional Officer London Fire Brigade) ; Louis T. Healy, A.Inst.E.E. (Royal Insurance Co.) ; R. O. Wynne-Roberts, M.Inst.C.E. ; Jos. Randall, A.M.Inst.C.E. ; Lieut. S. Sladen, R.N. (Divisional Officer, London Fire Brigade) ; Supt. J. Woollard (Chief Officer Ilford Fire Brigade).

Messrs. The Valor Company, Ltd., were represented on July 17th, by:—

Messrs. A. E. Wilson Browne, E. C. Barron; W. Ben Evans; Cecil Routledge; L. White; R. Williams.

on September 4th by:

Messrs. A. Wilson Browne; William Pettett; Cecil Routledge; L. White.

and on October 15th by:

Messrs. A. Wilson Browne; C. A. Hemingway; Cecil Routledge.

The following visitors attended at the Testing Station by special invitation of the Executive during the testing operations of July 17th, 1907:—

Messrs. T. R. Brooke; G. H. Betjemann; F. Baxter; G. T. Bullock (Union Fire Office); Chas. T. Cutler; F. H. Cann; Canon R. Duckworth, D.D. (Westminster Abbey); Chas. H. Freeman; R. Henderson; A. J. Ivory (Anglo-American Oil Co.); S. Marsland; W. L. Mandling; C. P. Merriam; S. A. Pollock (General Post Office); Oliver A. Richardson (Surveyor, Sun Insurance Office).

Signed,

For the Sub-Committee conducting the test:—
PERCY COLLINS.

For the General Testing Arrangements Sub-Committee:—
HORACE FOLKER.

For the Executive:—
JAMES SHEPPARD.

Published by the Committee as directed by the Executive.

C. F. ADAMI
(*Assist. Secretary*).
Date—November 20th, 1907.

Verified a true copy of the Report as ordered to be published.

ROSE, INNES, SON AND CRICK (*Solicitors*).
Date—December 3rd, 1907.

Lists of the Committee's Publications, Contents of the Committee's Journal, etc., are obtainable upon application to the Assistant Secretary, 1, Waterloo Place, Pall Mall, London, S.W.

SOUTHWOOD, SMITH & CO., LTD., LONDON.

365734

"RED BOOKS" OF THE
BRITISH FIRE PREVENTION COMMITTEE.—No. 125.
Edited by the Executive.

Load Test of Floors.

THREE FLOOR SLABS
OF
Reinforced Concrete
ON THE
HERBST ARMOCRETE TUBULAR SYSTEM,
BY
W. HERBST, BERLIN,
Now also known as
The Armoured Tubular Flooring Co., Ltd., London.

The Committee's Report.

LONDON, 1907.

PUBLISHED AT THE OFFICES OF
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(Founded 1897—Incorporated 1899).
1, WATERLOO PLACE, PALL MALL.

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Two Shillings and Sixpence.

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OBJECTS OF THE COMMITTEE.

The main objects of the Committee are :—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts, and translations.

To undertake such independent investigations and tests of materials, methods, and appliances as may be considered advisable.

The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.

The Committee is not responsible for the views of individual authors as expressed in Papers or Notes, but only for such observations as are formally issued on behalf of the Executive.

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CHARLES ADAMI, *Assistant Secretary.*

Fig. 12. SLAB A. *View on June 7th* (*South side*) (*load at* 920·70 *lbs. per square foot*).

Fig. 13. SLAB A. *View on June 8th* (*North side*) (*immediately after breaking*).

NOTE.

This report should be read in conjunction with Report No. 119, dealing with a floor of similar construction under a fire test.

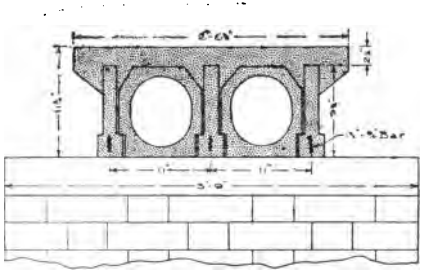
MAX CLARKE.

WATERLOO PLACE,
LONDON, S.W.
October 24th, 1907.

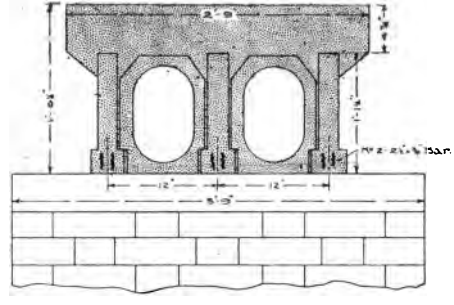
Before Test; January 24th, 1907.

After Test: June 27th, 1907 (2.33 p.m.).

Figs. 21 and 22. SLAB C. VIEWS BEFORE AND AFTER TESTING FROM NORTH SIDE.



CROSS SECTION



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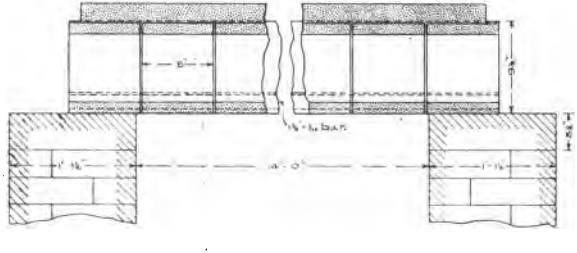
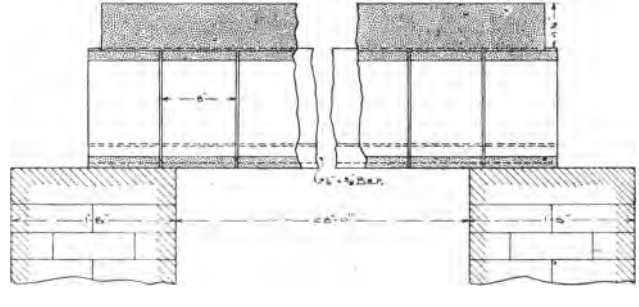


LONGITUDINAL SECTION

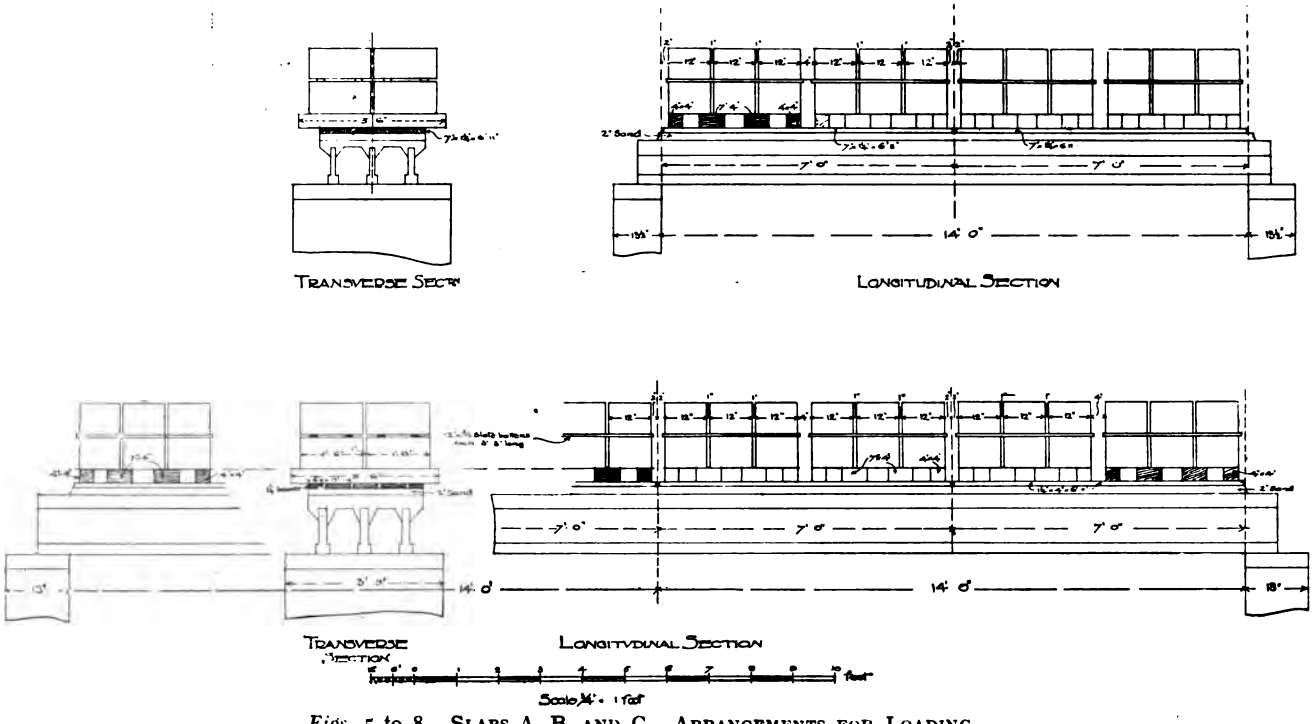
SLAB-A



LONGITUDINAL SECTION

SLAB-B

Figs 1 *to* 4 SLABS A AND B. DETAILS OF CONSTRUCTION.



Figs. 5 to 8. SLABS A, B, AND C, ARRANGEMENTS FOR LOADING.

OFFICIAL REPORTS

OF THE

British Fire Prevention Committee

[FOUNDED 1897—INCORPORATED 1899].

LOAD TESTS NO. AA.—JAN. 29TH AND 30TH, JUNE 7TH, 8TH AND 27TH, AND JULY 17TH, 1907.

THREE FLOOR SLABS

OF

REINFORCED CONCRETE

ON THE

HERBST ARMOCRETE TUBULAR SYSTEM

CONSTRUCTED BY

W. HERBST, BERLIN,

NOW ALSO KNOWN AS

THE ARMOURED TUBULAR FLOORING CO., LTD.,

LONDON.

OBJECT OF THE TESTS.

To record the results of applying loads to three beams:

Beam A. (14 ft. span). To be loaded to destruction. (*Breaking Test.*)

Beam B. (28 ft. span). To be loaded to destruction. (*Breaking Test.*)

Beam C. (14 ft. span). To be loaded with about 6 cwt. per super ft., the deflection then to be taken. The load then to be removed and the deflection again taken to ascertain what the permanent deflection is. (*Deflection Test.*)

NOTE.—Beam A was submitted to an additional preliminary load test for deflection, (*Preliminary Deflection Test*) and load removed prior to loading for breaking test.

NOTE.—The setting time was to be approximately six months. It varied from 24·5 to 27·3 weeks (winter and summer) for the main tests, and six weeks for the ordinary deflection test with Slab A.

SUMMARY OF TESTS.

SLAB A.

Preliminary Deflection Test.—Slab loaded with 5 cwt. per ft. super, deflection 0·3 in. and on load being removed slab returned to its normal level.

Breaking Test.—Slab loaded with 12 cwt. 1 qr. 14 lbs. per ft. super and then failed by breaking in the centre.

SLAB B.

Breaking Test.—Slab loaded with 7 cwt. 2 qrs. 17 lbs. per ft. super, when the deflection was 1·24 in. and there were cracks in the edges of the slab, and after 35 days from final test being applied, the deflection was 3·95 in.

SLAB C.

Breaking Test.—Slab loaded with 6 cwt. 2 qrs. 7 lbs. per ft. super and then failed by breaking in the centre.

NOTE.—The Slab being broken no deflection could be taken as intended after unloading.

The beams were constructed at the Committee's Testing Station and placed in position there. The load applied consisted of blocks of concrete each about 18 in. by 12 in. by 9 in. (0·457 *m.* by 0·305 *m.* by 0·228 *m.*), each block being weighed and the weight marked upon it.

CONSTRUCTION OF THE FLOOR SLABS.

The girders or webs and the tubes were made on the site.

The tubes were commenced on November 27th, 1906, and completed by December 7th.

The webs were made and the slabs were erected between December 12th, 1906, and December 18th.

CONSTRUCTION OF THE FLOOR SLABS A AND C (*See Figs. 1 to 4*).

The concrete webs were ⊥ shaped, 9½ in. (·241 *m.*) deep, 3 in. (·076 *m.*) wide on the soffit, reduced to 1½ in. (·038 *m.*) thick, 2 in. (·0508 *m.*) above the soffit, so forming a rebate or offset on each side.

Embedded in each web, about 1 in. (·0254 *m.*) above the soffit, was a wrought-iron corrugated bar 1¾ in. by $\frac{5}{16}$ in. (·0444 in. by ·0078 *m.*).

Hollow concrete tubes 9½ in. (·2413 *m.*) deep, 8½ in. (·216 *m.*) wide, and 8 in. (·2032 *m.*) long, were made with a rebate on each side to correspond with the rebate on the webs.

The webs were made in timber moulds. The concrete for them was composed of one part of Portland cement (The Associated Portland Cement Mnfrs., Ltd., "Ferrocrete" Brand) two parts of shingle, passing a ⅜ in. (·0095 *m.*) mesh, and one part of sand.

It was stated by the testor that the tubes were made by means of a hand press, and that the concrete for them was composed of one part of Portland cement, 7·5 parts of coke breeze, and five parts of sand.

To support each of the floor slabs, short lengths of brick walls 14 ft. (4·267 *m.*) apart were built, each wall being 3 ft. 9 in. (1·143 *m.*) long, 13_1 in. (·3427 *m*) thick and about 2 ft. (·6095 *m*) high, above the ground. On the top of each a York stone template $3\frac{1}{2}$ in. (·0888 *m.*) thick was bedded, covering the whole area of the wall.

On the last-mentioned templates three of the before-mentioned webs were placed, with a bed of cement under them. The two spaces between the webs were filled in with the hollow tubes before described and the whole of the top covered with concrete composed of one part of Portland cement and three parts of shingle, passing a ⅜ in. (·0095 *m.*) mesh of sufficient consistency to fill the joints between the webs and blocks and the triangular spaces at the top corners of the blocks. This was well rammed in between wooden centering, the sides of the top covering projecting beyond the sides of the webs so that the finished width of slab A was 2 ft. $6\frac{1}{2}$ in. (·7746 *m.*) and that of slab C was 2 ft. $5\frac{1}{2}$ in. (·7492 *m.*). The thickness of the concrete above the top of the webs was $2\frac{1}{4}$ in. (·0571 *m.*) making the total thickness of the floor, without any plastering on the soffit, $11\frac{3}{4}$ in. (·2984 *m.*). The top surface was trowelled to a smooth surface.

The slabs rested 9 in. (·2286 *m.*) at each end upon the walls.

In the centre of the length of these slabs a piece of iron 2 in. by ½ in. (·0508 by ·0127 *m.*) was fixed vertically outside each of the outside webs, with a horizontal bolt ½ in. (·0127 *m.*) diameter under the soffit and going through the vertical irons tightened up with a nut to prevent the webs spreading during the test. The top ends of the vertical irons were secured by a similar bolt embedded in the top covering concrete.

Construction of Floor Slab B. (*See Figs. 1 to 4.*)

The construction of this slab was similar to that of slabs A and C, except that the girders or webs and the tubes or hollow blocks were larger and the top layer of concrete was thicker.

The webs were average $13\frac{1}{2}$ in. (·3427 *m.*) deep, $3\frac{3}{4}$ in. (·0952 *m.*) wide, on the soffit reduced to $2\frac{3}{8}$ in. (·0603 *m.*) thick, $2\frac{1}{2}$ in. (·0635 *m.*) above the soffit.

Embedded in each web about 1 in. (·0254 *m.*) above the soffit were two wrought-iron corrugated bars $2\frac{1}{2}$ in. by ⅜ in. (·0635 *m.* by ·0095 *m.*). The hollow blocks were $13\frac{1}{4}$ in. (·3427 *m.*) deep, $8\frac{1}{2}$ in. (·2159 *m.*) wide, and 8 in. (·2032 *m.*) long, made as described for slabs A and C.

To support the floor slab, short lengths of walls 28 ft. (8·534 *m.*) apart were built, each wall being 3 ft. 9 in. (1·143 *m.*) long, 18 in. (·457 *m.*) thick, and about 1 ft. 9 in. (·5333 *m.*) high,

above the ground, on the top of each a template as before described, was bedded. The slab was constructed on these walls as described for beams A and C.

The slab rested 10 in. (·254) on the walls at each end.

The concrete, which was filled in over the top of the webs and blocks, was $4\frac{3}{4}$ in. (·1206 *m.*) thick above the top of the webs, making the total thickness of the floor without any plastering on the soffit $18\frac{1}{4}$ in. (·4634 *m.*).

This concrete covering projected beyond the sides of the webs as described in beams A and C, so that the total width of the top of the slab was 2 ft. 9 in. (·838 *m.*) wide.

There were three sets of iron bolts and vertical pieces of iron at the sides, one in the centre of the length as described for beams A and C. One 4 ft. $1\frac{1}{2}$ in. (1·257 *m.*) from east end and one 3 ft. 8 in. (1·1175 *m.*) from west end.

PREPARATION FOR THE TESTS.

Each floor slab was covered with sand 2 in. in thickness (·0508 *m.*), on the top of the sand were laid pieces of flooring boards 6 in. by $1\frac{1}{4}$ in. (·1524 *m.* by ·0317 *m.*) and 4 in. by $1\frac{1}{4}$ in. (·1016 *m.* by ·0317 *m.*) cut into lengths of 6 ft. 11 in. (2·108 *m.*), these were laid longitudinally on the sand with a space between the boards at the sides and ends.

On the top of the boards and across the slab were laid short lengths of deal 3 ft. 6 in. (1·0667 *m.*) long, some 4 in. by 4 in. (·1016 *m.* by ·1016 *m.*), and some 7 in. by 4 in. (·1778 *m.* by ·1016 *m.*) ready for the concrete loading blocks. (See *Figs.* 5 *to* 8.)

The levels were taken with a dumpy level and staff. The photographs were taken by daylight at intervals when considered necessary.

On January 24th, 1907, photographs were taken of the three slabs prior to test. (See *Figs.* 9, 16 *and* 20.)

LOG OF TESTS.

Tests of Slab **A.**

Preliminary Deflection Test.—On January 29th, 1907, a preliminary meeting was held, and one course of blocks put upon slabs A and C.

On January 30th, 1907, a second meeting was held at 2 p.m., when slab A was loaded with five complete courses of blocks and five blocks in addition. This was finished at 4 p.m.

Before Test: South side, January 24th, 1907.

After Test: North side, June 12th.

After Test: North side, June 12th.

Figs. 9 to 11. SLAB A. VIEWS BEFORE AND AFTER TEST.

This load was 5 cwt. per ft. super, not including the weight of the slab.

The maximum deflection when all the above blocks were on was 0·3 in.

Fig. 14. SLAB A. *View of centre of North Side after failure.*

Fig. 15. SLAB A. *View of North Side of East End after failure, June 12th.*

The slab was then unloaded, all but the first course of blocks, starting at 4.5 p.m., and after being unloaded, the deflection was nil.

Breaking Test.—The second test of this slab was made on June 7th and 8th, 1907, as follows :—

BREAKING TEST, SLAB A.

Area 35 ft. 6 in. Age, 24·5 weeks on June 7th, 1907.

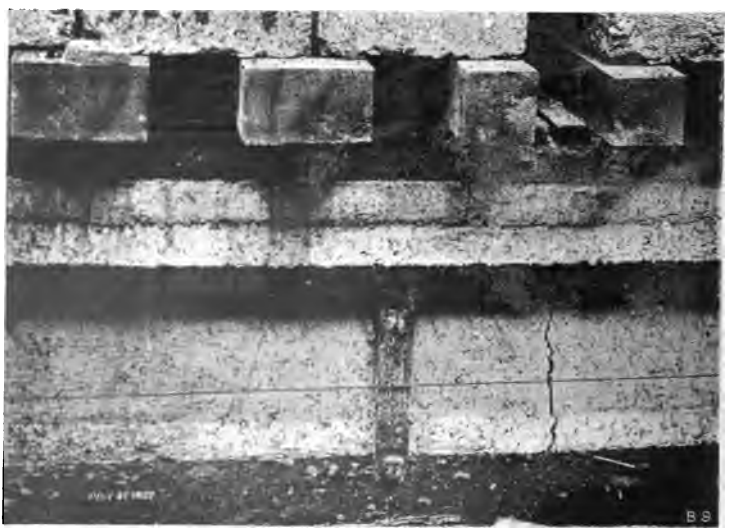
Note.—Weight of slab not included.

Date.	Courses completed	Total load on slab in lbs.	Load per ft. super. in lbs.	Mean deflection in centre.	Remarks.
				in.	
June 7, 1907	1	4,503	126·85		
,, 7, 1907	2	8,038	226·42		
,, 7, 1907	3	11,650	328·17		
,, 7, 1907	4	15,137	426·39		
,, 7, 1907	5	18,732	527·66		
,, 7, 1907	6	22,385	630·56		
,, 7, 1907	7	25,883	729·10	·72	There were cracks on both North and South sides of slab on each side of the centre vertical iron strap, gradually increasing.
,, 7, 1907	8	29,377	827·52	1·41	
,, 7, 1907 (9 p.m.)	9	32,685	920·70	1·74	See *Fig.* 12.
,, 8, 1907 (9.30 a.m.)	10	36,120	1,017·46	3·36	
,, 8, 1907	11	39,628	1,116·28	3·66	Shearing cracks on South side at both ends, starting at edge of bearing.
,, 8, 1907	½ of 12*	41,385	1,165·77		
,, 8, 1907	,, 13	43,159	1,215·75	4·44	
,, 8, 1907	,, 14	4,5049	1,268·99	4·95	
,, 8, 1907	,, 15	4,6920	1,321·69	5·85	
,, 8, 1907	,, 16	48,724	1,372·51	6·27	
,, 8, 1907	17	49,201	1,385·95		Slab suddenly collapsed by breaking in the centre, and iron bars drawing out of webs with load of 12 cwt. 1 qr. 14 lbs. per ft. super. See *Figs.* 10, 11, 13, 14 and 15.

*Where ½ course loaded, it was the central half (see *Fig.* 13.)

Fig. 16. SLAB B. *View of South Side before Testing (January 24th,* 1907).

South side, July 27th, 1907.



Centre of North side, July 27th, 1907.
Figs. 17 *and* 18. SLAB B.

Fig. 20. SLAB B. BREAKING TEST.
View on conclusion of Test, September 5th, 1907, loaded at 857·09 lbs. per square foot.

Test of Slab **B**.

Breaking Test.—On June 25th, one complete course of blocks was put on and on June 27th, the slab was loaded with six complete courses and half of the seventh course distributed.

The slab was left so until July 17th, when the test was completed as follows :—

BREAKING TEST, SLAB B.

Area, 77 ft. Age, 27·3 weeks on June 27th, 1907.
Note.—Weight of slab not included.

Date.	Courses completed.	Total load on slab in lbs.	Load per ft. super. in lbs.	Mean deflection in centre.	Remarks.
				in.	
June 25, 1907	1	9,000	116·88		
,, 27, 1907	2	16,128	209·45		
,, 27, 1907	3	23,040	299·22	·05	
,, 27, 1907	4	29,968	389·19	·29	
,, 27, 1907 (4.40 p.m.)	5	37,180	482·86	·43	
,, 27, 1907	6	44,315	575·52	·65	
July 17, 1907 (10.35 a.m.)	7	51,544	669·40	·83	
,, 17, 1907	8	58,907	765·03	·91	At 11.45 a.m. there were shearing cracks at each end on the North side, none on the South side, and various small vertical cracks on both sides near the centre.
,, 17, 1907	9	65,996	857·09	1·24	Completed at 1.30 p.m. See *Fig.* 19. Load, 7 cwt. 2 qrs. 17 lbs. per ft. super.
,, 25, 1907	9	65,996	857·09	3·66	Levels for deflection taken.
,, 27, 1907	9	65,996	857·09		Photos of North and South sides taken, showing cracks and portion of concrete fallen off, exposing the iron bar in South web. See *Figs.* 17 and 18.
Aug. 21, 1907	9	65,996	857·09	3·95	
Sept. 4, 1907	9	65,996	857·09		See *Fig.* 20 (taken September 5th).

On September 5th to 7th, 1907, the load was removed. The deflection was 3·03 in.

June 27th, 1907 (2.21 *p.m.*).
Fig. 23. Slab C. Detail of South Side.

TEST OF SLAB C.

First Test (Deflection Tests.)—On June 27th, 1907, the slab was loaded with six courses and twelve blocks, and the test was completed as follows :—

BREAKING TEST, SLAB C.

Area, 34 ft. 6 in. Age, 27.3 weeks to June 27th, 1907.

Note.—Weight of slab not included.

Date.	Courses completed.	Total load on slab in lbs.	Load per ft. super. in lbs.	Mean deflection in centre.	Remarks.
				in.	
June 25, 1907	0	897	26·00		Sand and wood only on beam.
,, 27, 1907	1	4,467	129,48		
,, 27, 1709	2	8,093	234·58		
,, 27, 1907	3	11,802	342·09		
,, 27, 1907	4	15,511	449·60		
,, 27, 1907 (1.15 p.m.)	5	19,082	553·10		
,, 27, 1907 (1.45 p.m.)	6	22,630	655·94		
,, 27, 1907	6 & 1/8ths of 7	24,380	706·67	·25	Slab suddenly collapsed at 1.55 p.m. with 12 blocks of 7th course on it by breaking in the centre. Load 6 cwt. 2 qrs. 7 lbs. per ft. super. See *Figs.* 22 23 and 24.
,, 28, 1907					Photos of North and South sides were taken after load had been removed. See *Figs.* 25 and 26.

GENERAL ARRANGEMENTS.

The test was carried out by a Sub-Committee comprising :—

Mr. Max Clarke, F.R.I.B.A., *Directing Member.*
Mr. Matt. Garbutt, F.R.I.B.A., *Deputy Directing Member.*
Mr. Percy Collins, J.P., F.S.S.
Mr. J. Herbert Dyer (Vice-Pres., Nat. Fire Brigades Union).
Mr. F. R. Farrow F.R.I.B.A.
Mr. William Grellier, F.R.I.B.A. (Dist. Surveyor).
Lieut. Col. J. Winn, R.E.

NOTE.—On January 30th, 1907, the whole of the members of the Sub-Committee were on duty. On June 7th Messrs Max Clarke, M. Garbutt and F. Farrow were on duty. On June 8th, Messrs. Max Clarke and M. Garbutt were on duty. On June 27th, Messrs. M. Garbutt and Wm. Grellier were on duty. On July 17th, Messrs. Max Clarke, J. H. Dyer, M. Garbutt and Wm. Grellier were on duty.

Mr. Lister assisted the Sub-Committee on January 30th, on June 7th, 27th, and July 17th, 1907.

The Council were represented for the testing operations on January 30th and June 27th, 1907, by :—

Sir Henry Tanner, I.S.O. (Principal Architect, H.M. Office of Works).

Sir James Williamson, C.B. (Late Director of H.M. Dockyards).

Also for the testing operations of January 30th, by :—

Mr. W. T. Hatch, M.Inst.C.E. (Chief Engineer, Metrop. Asylums Board).

The Executive was represented for the testing operations by :—

Mr. Edwin O. Sachs, F.R.S.Ed., *Chairman*.

Mr. Ellis Marsland (Dist. Surveyor), *Gen. Hon Secretary*.

Mr. James Sheppard, A.Inst.E.E. (Surveyor, North. Brit. and Merc. Ins. Co.)

Mr. J. W. Restler, M.Inst.C.E. (Deputy Chief Eng., Metrop. Water Board).

NOTE.—The Chairman attended on January 30th, June 7th, 8th, 27th, July 17th; the Gen. Hon. Secretary on June 7th, 8th, 27th, July 17th; Mr. Sheppard on January 30th, June 27th, July 17th; and Mr. Restler on June 27th.

The Committee's Hon. Medical Officer, Surgeon-Major R. J. Maitland Coffin, F.R.C.P., was in attendance on January 30th, June 7th, 27th, and July 17th, 1907.

The general body of members were represented for the testing operations of January 30th and June 27th, 1907, by :—

Messrs. T. W. Aldwinckle, F.R.I.B.A.; S. Flint Clarkson, F.R.I.B.A. (Dist. Surveyor); Louis T. Healy, A.Inst.E.E. (Royal Insurance Co.); H. King (Surveyor, Royal Exchange Assurance Co.); Percy E. Ridley, F.S.I., A.Inst.E.E.; and Lieut. S. Sladen, R.N. (Divis. Officer, London Fire Brigade).

Also on January 30th, by Messrs. W. D. Belcher; S. G. Gamble, F.S.I., A.M.Inst.C.E. (Divis. Officer, London Fire Brigade); F. W. Hamilton, F.R.I.B.A. (Dist. Surveyor); and R. P. Notley, F.R.I.B.A. (Dist. Surveyor).

Also on June 27th, by Messrs. Walter Dewes; W. Eastman; E. J. A. Fulkes (Surveyor, Royal Insurance Co.); and F. Sumner, M.Inst.C.E. (The Engineer, City of London).

Messrs. Herbst were represented on January 30th, by Mr. W. Herbst; on June 7th and 27th, by Mr. H. C. Werner, C.E.; on June 7th, 8th, and July 17th, by Mr. G. M. Beer; and on June 7th, 8th, 27th, and July 17th, by Mr. E. von Mandelsloh.

The following visitors attended the Testing Station by special invitation of the Executive during the testing operations of January 30th, 1907.

Col. Sir E. Raban, K.C.B. (Director of Works, Admiralty); Messrs. Arthur Ashbridge, F.R.I.B.A. (Dist. Surveyor); Wm. Austin; Dietrich von Bethmann-Hollweg (German Embassy); W. H. Carment; A. E. Carey, M.Inst.C.E.; A. R. Dyer, A.M.Inst.C.E. (Assist. Divis. Officer, London Fire Brigade); H. C. Else; G. Humbert (German Consul); Chas.

South side, June 27th, 1907 (2.17 *p.m.*).

North side, June 28th, 1907.

North side, June 28th, 1907.

Figs. 24 *to* 26. SLAB C. VIEWS AFTER TEST

365734

M. Hadfield ; Ernest Hadfield ; Johann Hosp ; H. H. Hodkin ; Russell J. Longmore (Phœnix Assurance Co.) ; E. Latham : A. W. Mo re, F.R.I.B.A. ; Col. G. K. Scott Moncrieff, C.I.E. (Assist. Director of Fortifications) ; Philip Munday ; A. MacLeod (Arch. Dept., L.C.C.) ; George Reeves ; R. H. Radford, M.I.M.E. ; E. R. Skipwith ; M. Symington ; George J. Stubbings (Supt. of Fire Brigade, G.E. Railway [since deceased] ; Major H. Tullock, R.E.; A. F.Watson, F.R.I.B.A.; T. Wilkinson.

Also during testing operations of June 7th and 8th :—Messrs. H. V. Brinsmead ; H. C. Cater, C.E. ; D. Donaldson ; Leonard V. Hunt, F.R.I.B.A. ; and T. Watson.

Also during the testing operations of June 27th :—Messrs. T. W. Amerson ; Harold H. D. Anderson ; W. H. A. Berry ; Herbert C. Berry ; Chas. H. Freeman ; A. A. Fillary (Dist. Surveyor) ; B. G. Fabian (Hand-in-Hand Fire Office) ; R. Henderson ; R. D. Hansom (Dist. Surveyor);Walter K. Hatrell; W. J. Hardcastle, F.R.I.B.A. ; H. Lambert ; H. Margesson ; Capt. Mandling (War Office) ; F. Melhuish ; W. Partridge (Central Electric Supply Co.) ; W. Herbert Rogers (Deputy Dist. Surveyor) ; W. A. Rees (Surveyor, Liverpool and London and Globe Insurance Co.) ; Oliver A. Richardson (Surveyor, Sun Insurance Office) ; F. J. Osborne Smith, A.R.I.B.A. ; F. F. Smith ; F. G. Stubbings (Fire Dept., G.E. Railway) ; Capt. Tiddulph (War Office) ; Capt. Vickers, R.E. (War Office) ; E. A. Wilson (Eng. Dept., G.E. Railway) ; T. Watson, and a deputy for Mr. J. C. Stransom (Archts. Dept. London County Council).

Also during both the testing operations of January 30th and June 27th :—Messrs. C. H. Colson, M.Inst.C.E. (Supt. Civil Engineer, Admiralty) and T. H. Johnson (General Post Office).

Signed,

For the Sub-Committee conducting the Tests :—
MAX CLARKE.

For the General Testing Arrangements Sub-Committee :—
MATT. GARBUTT.

For the Executive :—
ELLIS MARSLAND.

Published by the Committee as directed by the Executive.

C. F. ADAMI
(*Assist. Secretary*).
Date—October 24th, 1907.

Verified a true copy of the Report ordered to be published.

ROSE, INNES, SON AND CRICK (*Solicitors*).
Date—November 5th, 1907.

Lists of the Committee's Publications, Contents of the Committee's Journal, etc., are obtainable upon application to the Assistant Secretary, 1, Waterloo Place, Pall Mall, London, S.W.

SOUTHWOOD, SMITH & CO., LTD., LONDON.

"RED BOOKS" OF THE
BRITISH FIRE PREVENTION COMMITTEE.—No. 126.
Edited by the Executive.

368:340

FIRE TESTS
WITH
FIRE EXTINGUISHERS.

FIRE EXTINGUISHERS
Known as the "Accurate" Extinguishers,

SUBMITTED FOR TEST BY

THE TEA TRAY COMPANY, NEWARK, N.J., U.S.A.,

REPRESENTED BY

THE UNDERWRITERS' FIRE APPLIANCES, LTD.,

LONDON.

The Committee's Report.

LONDON, 1908.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(*Founded 1897—Incorporated 1899*).
3, WATERLOO PLACE, PALL MALL.

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ALL RIGHTS RESERVED.

LONDON, 1908.

PUBLISHED AT THE OFFICES OF
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(*Founded* 1897—*Incorporated* 1899),
1, WATERLOO PLACE, PALL MALL.

Two Shillings and Sixpence.

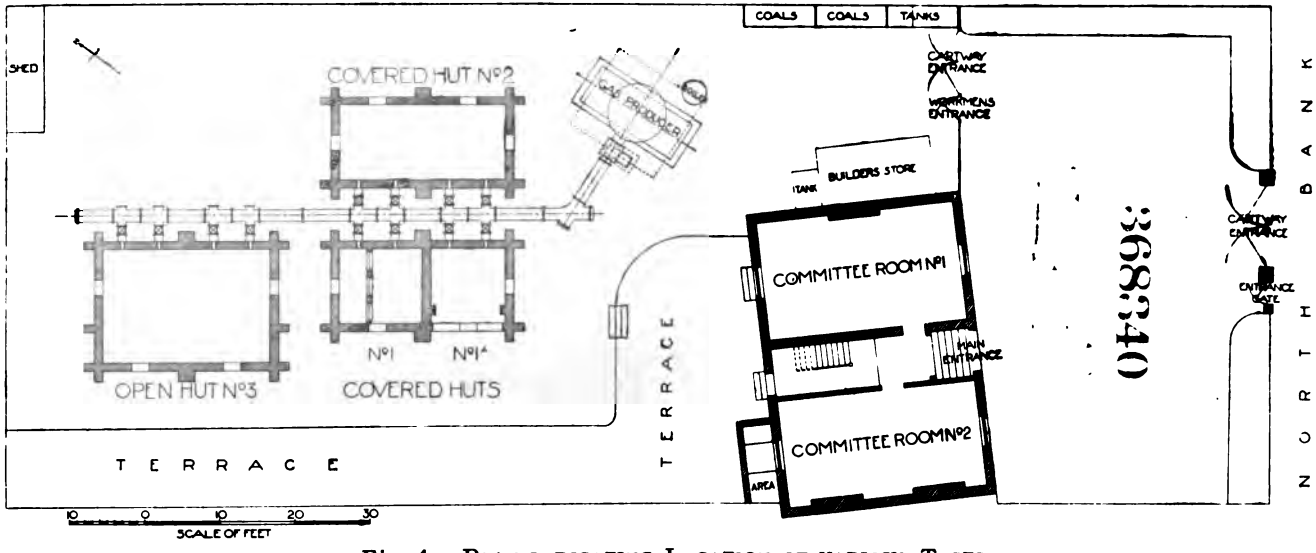

Fig. A. PLAN INDICATING LOCATION OF VARIOUS TESTS.

Fig. 1. TEST NO. 1 (*View before Test*).
(*See page* 13.)

Fig. 2. TEST NO. 1 (*View after Test*.
(*See page* 13.)

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Chairman of the Executive:

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PROFESSOR ARCHIBALD BARR, D.Sc., M.Inst.C.E., Glasgow University.
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SIR W. MARTIN CONWAY, M.A., F.S.A.
ALFRED DARBYSHIRE, F.S.A., Past-Vice-Pres. Royal Institute of British Architects.
MAJOR-GENERAL E. R. FESTING, C.B., F.R.S., late Victoria and Albert Museum.
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W. H. HUNTER, M.Inst.C.E., Chief Engineer Manchester Ship Canal.
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ROBERT VIGERS, Past President the Surveyors' Institution.
ARTHUR WHITELEGGE, C.B., M.D., Chief Inspector of Factories, Home Office.
SIR JAMES WILLIAMSON, C.B., late Director of H.M. Dockyards.
SIR HENRY TRUEMAN WOOD, M.A., Secretary Society of Arts.

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J. HERBERT DYER, Sen. Vice-Pres. Nat. Fire Brigades' Union;
CHARLES E. GOAD, M.Am.Soc.C.E.;
J. W. RESTLER, M.Inst.C.E., Dep.-Chief Eng. Metropolitan Water Board;
JAMES SHEPPARD, A.Inst.E.E., Surveyor North British and Merc. Ins. Co.;
OSWALD C. WYLSON, F.R.I.B.A.

Gen. Hon Secretary:

ELLIS MARSLAND, District Surveyor.

Hon. Auditors:

HORACE S. FOLKER, F.A.I., Vice-Pres. Nat. Fire Brigades' Union.
R. J. MAITLAND-COFFIN, F.R.C.P., Surg.-Major.

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Regent Street, London, W.

Offices:

WATERLOO PLACE, PALL MALL, LONDON, S.W.

CHARLES ADAMI, *Assistant Secretary.*

NOTE.

The series of tests with the "Accurate" chemical fire extinguisher again showed that hand chemical fire extinguishers, as a class, can be employed with advantage in the incipient stages of small fires. If a fire has obtained such proportions that it cannot be extinguished by chemical hand fire extinguishers, still they may be useful to keep it in check until larger fire appliances can be brought into play —this applies especially to loose material.

It is advisable that chemical first-aid appliances be examined and tested periodically, care being taken that the nozzle is always kept clear and the rubber tube in good condition.

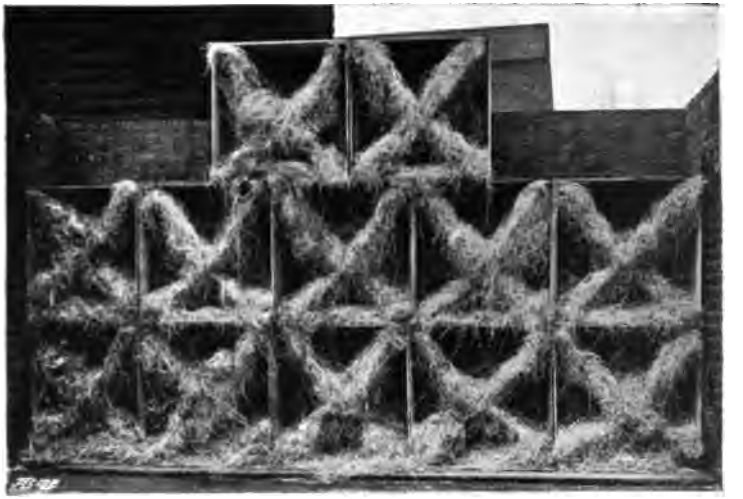
Hand fire extinguishing appliances should always be constructed so as to allow of convenient handling.

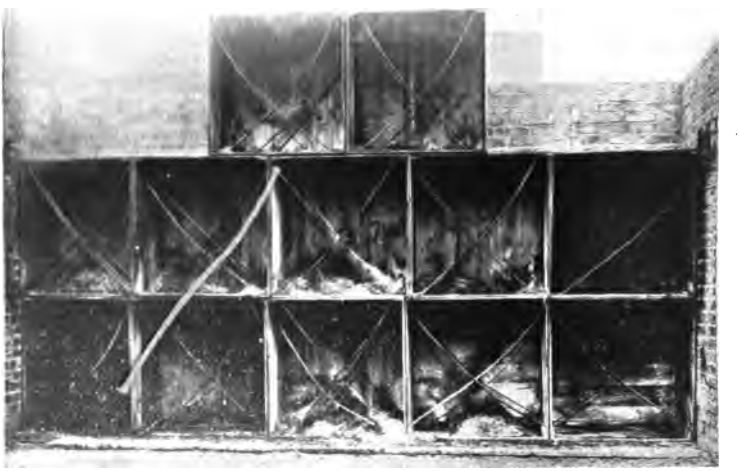
PERCY COLLINS.

1, WATERLOO PLACE,

LONDON, S.W.

April 9th, 1908.





Figs. 4 and 5. TEST NO. 4 (*Views before and after Test*).

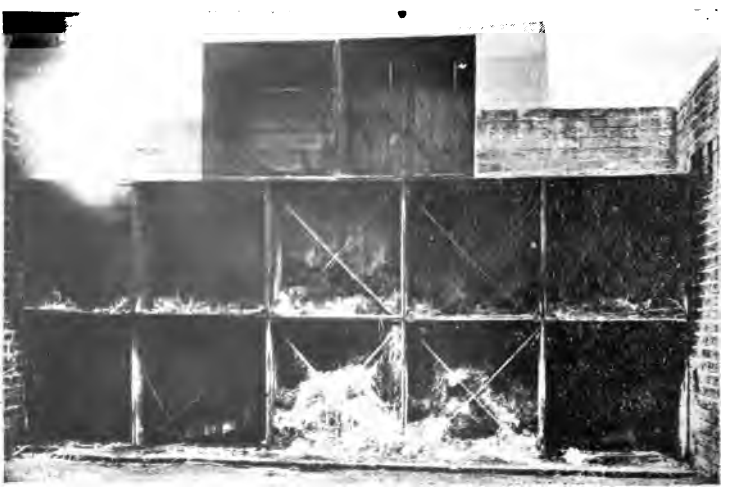


Fig. 5A. TEST NO. 4A (*View after Test*).

OFFICIAL REPORTS

OF THE

British Fire Prevention Committee

[FOUNDED 1897—INCORPORATED 1899].

FIRE TEST No. 93.—FEBRUARY 6TH, 1908.

FIRE EXTINGUISHERS

KNOWN AS THE

"ACCURATE" EXTINGUISHERS

SUBMITTED FOR TEST BY

THE TEA TRAY Co.,

NEWARK, N.J., U.S.A.,

REPRESENTED BY

THE UNDERWRITERS' FIRE APPLIANCES, LTD.,

LONDON.

OBJECTS OF TESTS.

To ascertain the effect of the application of "Accurate" Fire Extinguishers (supplied by the testor) upon various burning materials both in a room and in the open.

Note.—The tests comprised those ordered by the Committee (Nos. 1 to 12) and a "demonstration" test (A) undertaken at the request of the testor.

The tests were in certain instances followed by *re-tests*, ordered by the Committee (Nos. 4A, 9A, and 10A).

Note.—Test A was the "demonstration" test undertaken by the testor, and a great blaze of flame was obtained from liquids of a volatile character, the fire having but little body.
The "demonstration" test should not be looked upon as a practical one.

The follcwing tests were applied :—

THE TESTS APPLIED.

The Committee's Tests

TEST No. 1.—This test was undertaken to note the effect of the extinguisher upon a fire which was started at a dressing table in a bedroom with curtains, etc., above, the dressing table being draped with loose material and having inflammable articles lying thereon.

TEST NO. 2.—This test was undertaken to note the effect of the extinguisher upon hay in a raised wooden rack in a stable.

TEST NO. 3.—This test was undertaken to note the effect of the extinguisher upon a burning crate of loose wood-wool, such as might be found in a packing room of a wholesale or retail store.

TESTS NOS. 4 AND 4A.—These tests were undertaken to note the effect of the extinguisher upon a stack of twelve packing cases, stacked against a wall, open face outwards and each containing a small quantity of inflammable material such as would be used for packing.

TEST NO. 5.—This test was undertaken to note the effect of the extinguisher upon a pyramidical stack of wood with wood-wool filled in.

TEST NO. 6.—This test was undertaken to note the effect of the extinguisher upon a burning heap of straw and small pieces of soft wood damped with water.

TEST NO. 7.—This test was undertaken to note the effect of the extinguisher upon burning celluloid.

TEST NO. 8.—This test was undertaken to note the effect of the extinguisher upon burning logs, the fire being fed by laths and wood-wool.

TESTS NOS. 9 AND 9A.—These tests were undertaken to note the effect of the extinguisher upon burning petrol vapour.

TESTS NOS. 10 AND 10A.—These tests were undertaken to note the effect of the extinguisher upon a burning heap of loose rubbish composed of wood-wool, shavings, hay, straw, waste paper and cotton rags.

TEST NO. 11.—This test was arranged to note the effect of the extinguisher upon a bonfire composed of hay, straw, wood-wool and shavings when in an exposed position.

TEST NO. 12.—This test was undertaken to note the effect of the extinguisher upon a series of burning heaps of oily rags and dirty cotton waste.

Note.—Tests Nos. 4A, 9A, and 10A were re-tests by order of the Committee.

The Testor's "Demonstration" Test.

TESTOR'S DEMONSTRATION TEST A.—This demonstration test was undertaken by the testor to exhibit the effect of the extinguisher on a structure 8 ft. 6 in. long by 8 ft. high at front (2·591 *m.* by 2·438 *m.*), 7 ft. high (2·134 *m.*) at back, by 3 ft. (0·914 *m.*) deep. The whole was well tarred all over, petroleum and petrol were poured over the inner side and the contents of the structure immediately before the test.

SUMMARY OF THE TESTS.

The following is a summary of the results of the tests ordered by the Committee :—

The tests demonstrated that the extinguishers when brought into action, and properly handled, were uniformly efficient in checking small fires in their early stages.

In some instances one appliance more than sufficed to completely extinguish small fires.

Where the material ignited was soft and loose, some difficulty was apparent in stopping the smouldering which ensued; the flames, however, could be kept in check and nearly extinguished.

The extinguishers were somewhat inconvenient to handle.

The following table summarises the number of extinguishers used, the time occupied in their application, the distance at which they were operated, and the effect noted :—

Test or Re-test.	Extinguishers. ▭Large. (B)	Extinguishers. *Small. (A)	Time occupied. min.	Time occupied. secs.	Distance of Operator. At first.	Distance of Operator. At end.	Remarks.
No. 1	—	1	0	45	12 ft. (3·657 *m.*)		Fire out.
,, 2	2	—	3	21	12 ft. (3·657 *m.*)	at close qtrs.	Fire kept in check, but broke out again and was put out eventually by buckets of water.
,, 3	1	—	3	47	6 ft. (1·828 *m.*)	at close qtrs.	Fire checked, and after being raked over was extinguished.
,, 4	2	1	4	35	15 ft. (4·572 *m.*)	at close qtrs.	Fire out.
,, 4A	2	1	5	10	Ditto		Fire out.
,, 5	1	—	2	51	at close quarters		Fire out.
,, 6	1	—	0	53	at close quarters		Fire out.
,, 7	1	—	0	25	6 ft. (1·828 *m.*)	at close qtrs.	Fire out.
,, 8	2	—	3	10	at close quarters		Fire out.
,, 9	2	—	2	29	6 ft. (1·828 *m.*)	at close qtrs.	Fire out. Petrol burnt itself out.
,, 9A	2	—	(? *time*).		6 ft. (1·828 *m.*)	at close qtrs.	Fire out. Petrol consumed.
,, 10	4	—	4	55	6 ft. (1·828 *m.*)	at close qtrs.	Fire checked. Eventually put out by water.
,, 10A	3	1	5	0	Ditto		Ditto.
,, 11	2	—	3	5	13 ft. (3·962 *m.*)	at close qtrs.	Fire practically out. Eventually put out by water.
,, 12	2	—	1	20	6 ft. (1·828 *m.*)	at close qtrs.	Fire practically out, but on bursting out again was extinguished by a second extinguisher.

▭ Large extinguishers contain 3 gall. (13·630 *l.*). * Small extinguishers contain 2 gall. (9·087 *l.*).
Tests marked with affix A were re-tests.

CONDITIONS OF TEST.

The following rules were laid down by the Executive and served as a guide for the tests :—

The tests will generally be taken in numerical order, subject to alteration by the directing member.

Tests will, where considered advisable by the Sub-Committee, be repeated at their discretion (known as re-tests).

The extinguisher will be applied at the desire of the Sub-Committee either by a member of the Committee or the testor, or by a nominee of either.

The Committee provide material for certain tests as may be directed by the Sub-Committee and the testor for the others, but the Sub-Committee may replace the material provided by the testor by their own or use their own at re-tests.

The fire having been allowed to progress at the discretion of the directing member, the extinguisher will be applied from a position and at a distance pointed out by him, a time limit being set to each test at his discretion.

Directly the number of extinguishers specified have been used or the time limit has been reached, a whistle will be sounded and the test stopped, and any fire remaining will be extinguished otherwise than by extinguishers.

Directly a fire has been extinguished by an extinguisher, a whistle will be sounded and the test stopped.

The party extinguishing a fire must not touch the material under test except with the liquid from extinguisher, unless by direction of the directing member.

The contents of any extinguisher on the ground may be reserved for analysis, and any extinguisher or extinguishers reserved for examination.

The arrangements are subject to alteration by the directing member.

The testor may put forward four "Demonstration" tests for the cognisance of the Sub-Committee, making his own arrangements and providing his own materials, but the Sub-Committee shall if it considers advisable order these tests to be repeated or repeated with variations to serve as Counter-Demonstrations.

ACCURATE
FIRE EXTINGUISHER
THE TEA TRAY COMPANY OF NEWARK N.J.
TESTED TO 350 LBS.
DIRECTIONS FOR CHARGING.
FILL EXTINGUISHER WITH WATER
TO INSIDE PROJECTION;
ADD 1 lbs. BI-CARBONATE SODA;
STIR WELL; FILL BOTTLE TO MARK
WITH SULPHURIC ACID; 4 FLUID OZ.;
INSERT STOPPLE IN BOTTLE,
PLACE BOTTLE IN CAGE;
SCREW COVER ON TIGHT;
PROTECT FROM FREEZING;
RECHARGE AND RECHARGE ONCE A YEAR;
CLEAN EXTINGUISHER THOROUGHLY
BEFORE RECHARGING;
RECORD DATE LAST CHARGED ON CARD
ATTACHED TO EXTINGUISHER.

Fig. B.—THE EXTINGUISHER.

DESCRIPTION OF APPLIANCE.

(*Taken from the Maker's Description.*)

The appliance consists of a 17-gauge "Lake Superior" cold-rolled copper cylindrical vessel closed at either end, lined with lead on the inside, and is stated by the maker to be capable of resisting an internal pressure of 350 lbs. per sq. in. (equal to about 22 atmos.).

An opening is formed at one end of the vessel fitted with a metal collar 3½ in. (·089 *m.*) dia., having threads cut on its outer face, over which a cap with a rubber washer is screwed. A ring forming part of the cap affords facility for screwing and unscrewing.

A curved tube ¾ in. (·019 *m.*) dia. is secured to the vessel at its capped end; one end of this tube finished flush with the inner face of the vessel where it is protected by wire gauze, the outer end is fitted with connection for a screwed union to which is attached stout rubber hose equal in length to the height of the vessel, and terminating in a leaden nozzle having an outlet 3/32 in. (·00235 *m.*) dia. for a 2 gall. and slightly larger for a 3 gall. extinguisher.

A cage formed with four metal rods having their ends fixed to rings, the upper ring divided to admit of the rods being spread to receive the acid bottle and allow of its expansion. The cage with its acid bottle in position is passed through the opening surrounded by the collar, which has projections on the inside for supporting the cage in place. The glass acid bottle is closed by a leaden stopper having a conical projection which passes loosely into the neck of the bottle; the surfaces of the glass and stopper where in contact are ground with the object of making an air-tight joint.

Marks on the inside of the vessel and on the bottle indicate the proper levels for the charge of water in which bicarbonate of soda is dissolved and for the acid respectively.

To use the appliance it is turned upside down, causing the stopper to fall from the bottle as far as the inner face of the cap will permit, gradually liberating the acid, which, mixing with the bicarbonate solution, generates large volumes of carbon di oxide, causing pressure sufficient to eject with considerable force all the liquid the vessel contains.

The following models were under test:—

Small Model A—2 *Gallon*, Copper (9·087 *l.*).
Weight, unfilled .. .. 12 lbs. (5·44 *kg.*)
Weight, filled .. .. 26 lbs. (11·79 *kg.*)
Measurements: Height, 19½ in. (0·489 *m.*); dia., 7 in. (0·178 *m.*).

Large Model B—3 *Gallon*, Copper (13·630 *l.*).
Weight, unfilled .. .. 16½ lbs. (7·48 *kg.*)
Weight, filled .. .. 37 lbs. (16·78 *kg.*)
Measurements: Height, 24 in. (0·610 *m.*); dia., 7 in. (0·178 *m.*).

Fig. C.—Holder, Acid Bottle, and Stopper.

Fig. D.—Assembled.

RANGE OF THE APPLIANCE.

The following extinguishers were tested for range and duration on 27th March, 1908:—

2 Gallon extinguisher (charged 4th March, 1908).—Range of action, 35 ft. (10·67 *m.*), maintained to the end; exhausted in 52 secs.

3 Gallon extinguisher (charged 4th March, 1908).—Range of action, 35 to 40 ft. (10·67 to 12·19 *m.*), maintained to the end, but the quality of the jet varied, and at one time it dropped to 30 ft., and immediately after increased to 40 ft.; exhausted in 1 min. 20 secs.

2 Gallon extinguisher (charged 27th March, 1908, immediately before testing).—Range of action, 35 to 40 ft. (10·67 to 12·19 *m.*), maintained to the end; exhausted in 53 secs.

3 Gallon extinguisher (charged 27th March, 1908, immediately before testing).—Range of action, 35 to 40 ft. (10·67 to 12·19 *m.*), maintained to the end; exhausted in 1 min. 7 secs.

DESCRIPTION OF TESTING PLANT.

The tests were conducted at the Committee's Testing Station at North Bank, Regent's Park.

Of the tests, Nos. 5, 9, 9A, 11, and A were undertaken in the open and tests Nos. 1, 2, 3, 4, 4A, 6, 7, 8, 10, 10A, and 12 in the testing chambers of the Committee.

Testing Chambers Nos. 1, 1A, 2 and 3 were used.

Test No. 2 was undertaken in Hut No. 1; tests Nos. 3, 7 and 12 in Hut No. 1A; tests Nos. 1, 6, 10 and 10A in Hut No. 2; and tests Nos. 4, 4A and 8 in Hut No. 3. Of the tests in the open test No. 11 was taken on the top of Hut No. 1A.

Testing Chamber No. 1 was a covered hut measuring 10 ft. by 10 ft. by 8 ft. high (3·048 by 3·048 by 3·048 by 2·438 *m.*). Testing Chamber No. 1A was a covered hut with its front open and measured 10 ft. by 10 ft. by 8 ft. 11 in. (3·048 by 3·048 by 2·717 *m.*) Testing Chamber No. 2 was a covered hut measuring 22 ft. 3 in., by 10 ft. by 8 ft. 3 in. (6·781 by 3·048 by 2·514 *m.*) Testing Chamber No. 3 was an open hut without roof, measuring 22 ft. 3 in. by 15 ft. floor surface (6·781 by 4·572 *m.*).

Note.—The materials for the Committee's Tests were of the ordinary description, and were provided by the Committee, with the exception of the materials for Tests 4, 4A, 9, 9A, and Testor's Demonstration A, which were provided by the testor.

PREPARATION FOR AND CONDUCT OF THE TESTS.

The tests were undertaken on February 6th and March 4th, 1908.

The weather on February 6th was fine and warm. The wind W.S.W. The Barometer at 3 p.m. at the Botanical Gardens registered 30·68 in., and the Thermometer 56·5° Fahr.

The tests took place from 1.30 p.m. to 4.15 p.m.

The weather on March 4th was fine. The wind was N.

The barometer at 3 p.m. at the Botanical Gardens registered 29·69 in., and the thermometer 51° Fahr.

The tests took place from 12 noon to 1 p.m.

All the extinguishers used were provided and charged by the testor. The majority were charged on the day of the test.

The Directing Member of the Sub-Committee decided *ad hoc* immediately before the commencement of each test or re-test, whether a nominee of the testor or of the Committee should operate the appliances. The nominees of the testor were in every case members of his London representatives' permanent staff; the nominees of the Committee were either members or officials of the Committee or visitors.

THE OBJECT OF CONDITIONS AND ARRANGEMENTS FOR THE TESTS, WITH THE LOG OF EACH TEST.

TEST No. 1.

Object of Test No. 1.—This test was undertaken to note the effect of the extinguisher upon a fire which was started at a dressing table in a bedroom with curtains, etc., above, the dressing table being draped with loose material and having inflammable articles lying thereon.

Arrangements for Test No. 1.—Against the south wall of Hut No. 2 was placed a small deal table which had a covering and valance of figured muslin. On the table were celluloid combs, boxes, and a hand glass. On the right of the table was a cane-seated chair, and on the left a similar chair and a wicker basket containing waste paper. Above the table was a wooden cornice with valance and pole, over which were hung two pairs of lace curtains with two paper fly-catchers. The wall at the back of the table and the two side walls for some few feet on either side were papered. (*See Fig.* 1.)

Log of Test No. 1.—The waste paper in the basket was lighted and the fire was allowed to burn for 1 minute.

The flames obtained a fair hold of the materials.

Fig. 3. TEST NO. 2 (*View after Test*).

One small extinguisher was applied by a nominee of the testor, who stood 12 ft. (3·657 *m.*) away.

The fire was extinguished in 45 secs.

The paper basket and the paper were burnt. The window curtains and fly-catchers were consumed. The paper on the wall was slightly scorched. The celluloid articles on the table were not ignited. (*See Fig.* 2.)

TEST No. 2.

Object of Test No. 2.—This test was undertaken to note the effect of the extinguisher upon hay in a raised wooden rack in a stable.

Arrangement for Test No. 2.—Opposite the door in west side of Hut No. 1, was placed a wooden erection to represent a hay rack in a stable. This rack was composed of light strips of wood, fixed 3 ft. 4 in. (0·483 *m.*) above the floor. It was 5 ft. 8 in. (1·727 *m.*) long, 2 ft. 4 in. (0·711 *m.*) deep, and 3 ft. (0·914 *m.*) from back to front. The back and one end were formed by the brickwork of the hut; the front, bottom, and one end, of wood strips. Half a truss of hay was placed loosely in the rack.

Log of Test No. 2.—The hay was lighted at one point and allowed to burn for 1 min.

The flames obtained a good hold of the hay.

Two large extinguishers were applied by a nominee of the testor, who stood at first 12 ft. (3·657 *m.*) away, but afterwards went inside the hut, and worked intermittently at close quarters.

In 3 min. 21 secs. the extinguishers were exhausted.

The flames were held in check, and at times apparently extinguished, but smouldering continued and fire broke out again and was eventually put out by water. (*See Fig.* 3.)

TEST No. 3.

Object of Test No. 3.—This test was undertaken to note the effect of the extinguisher upon a burning crate of loose wood-wool, such as might be found in a packing room of a wholesale or retail store.

Arrangements for Test No. 3.—A lightly made crate, composed of strips of wood and measuring 4 ft. by 3 ft. 3 in. by 1 ft. 10 in. (1·219 *m.* by 0·991 *m.* by 0·558 *m.*) deep, was loosely filled with wood-wool. The crate was raised about 5 in. (·127 *m.*) from the floor of Hut No. 1a, being stood on four bricks.

Log of Test No. 3.—The fire was lighted in two places and allowed to burn for 52 secs.

The flames had obtained complete hold of the wood-wool, and had slightly charred the crate.

One large extinguisher was applied by a nominee of the testor, who stood 6 ft. (1·828 *m.*) away for 38 secs., and thereupon worked at close quarters.

The fire was checked and after being slightly raked over was extinguished in 3 mins. 47 secs. A small quantity only of wood-wool remained.

TESTS Nos. 4 AND 4A.

Object of Test No. 4.—This test was undertaken to note the effect of the extinguisher upon a stack of twelve packing cases stacked against a wall, open face outwards and each containing a small quantity of inflammable material such as would be used for packing.

Arrangements for Test No. 4.—Twelve wooden cases each measuring about 3 ft. (0·914 *m.*) square by 2 ft. deep (0·609 *m.*) were piled up against the north wall of Hut No. 3, facing south. Some small pieces of laths and a little wood-wool was strewn about inside the cases. (*See Fig.* 4.)

Log of Test No. 4.—The fire was lighted at two points and allowed to burn for 45 secs. The flames obtained a fair hold of the inside of most of the cases.

Two large and one small extinguishers were applied by a nominee of the Committee, first at 15 ft. (4·572 *m.*) away, and then at close quarters.

All extinguishers were exhausted. Time, 4 min. 35 secs.

The shavings and loose material in most of the cases were consumed and the interior much charred.

In the remaining cases the loose material was partly consumed and the interiors of the cases slightly charred.

A little smouldering was left, but this soon died down and went out. (*See Fig.* 5.)

Arrangements of Re-test No. 4A.—The arrangements for the re-test were identical with those for the test.

Log of Re-test No. 4A.—The fire was lighted at two points and allowed to burn for 55 secs. The flames obtained a good hold of the contents.

Two large and one small extinguishers were applied by a nominee of the testor, first at 15 ft. away (4·572 *m.*), and then at close quarters.

All the extinguishers were exhausted. All loose material was practically destroyed, and the interior much charred.

The fire was extinguished in 5 min. 10 secs., except a little smouldering, which subsequently died down.

TEST No. 5.

Object of Test No. 5.—This test was undertaken to note the effect of the extinguisher upon a pyramidical stack of wood with wood-wool filled in.

Arrangements for Test No. 5.—A pyramidical stack of wood was erected in the open, about 12 ft. (3·657 *m.*) high and about 6 ft. (1·828 *m.*) in diameter at base and filled in with some small pieces of wood, laths and wood-wool.

Log of Test No. 5.—The fire was lighted at two points and allowed to progress for 1 min.

The flames obtained no practical hold upon the wood.

One large extinguisher was used by a nominee of the testor, who applied it at close quarters all round the pyramid.

The fire was extinguished in 2 mins. 51 secs.

All wood-wool and loose material was consumed and the wood slightly charred.

TEST No. 6.

Object of Test No. 6.—This test was undertaken to note the effect of the extinguisher upon a burning heap of straw and small pieces of soft wood damped with water.

Arrangements for Test No. 6.—A bushel of small pieces of soft wood was mixed with half a truss of straw and loosely stacked on floor of Hut No. 1, forming a heap about 2 ft. high (0·609 *m.*) and 4 ft. (1·219 *m.*) in diameter and one gallon (4·543 *l.*) of water sprinkled over same.

Log of Test No. 6.—The fire was lighted at one point and was allowed to progress for 2 mins.

The flames obtained a fairly good hold of the straw.

One large extinguisher was applied at close quarters by a nominee of the testor for 30 secs. and the fire was apparently extinguished, but after 30 secs. was played on again and put out in a further 23 secs.

A little over one-half of the straw was consumed.

TEST No. 7.

Object of Test No. 7.—This test was undertaken to note the effect of the extinguisher upon burning celluloid.

Arrangements for Test No. 7.—A circular heap of celluloid shavings, scraps and dust, measuring about 2 ft. diameter by about 1 ft. high (0·609 *m.* by 0·305 *m.*) in the centre, was placed on the floor of Hut No. 1a.

Log of Test No. 7. — The fire was lighted at one point and allowed to burn for 5 secs.

The flames immediately obtained a good hold of the celluloid.

One large extinguisher was applied by a nominee of the testor standing 6 ft. (1·828 *m.*) away, and afterwards approaching to close quarters.

Fig. 6. TEST No. 8 (*View after Test*).

In 25 secs. the fire was put out.

The extinguisher was not exhausted.

A very small quantity of the celluloid was not consumed, but was considerably damped by the contents of the extinguisher. It was afterwards set alight, when it burnt itself out.

TEST No. 8.

Object of Test No. 8.—This test was undertaken to note the effect of the extinguisher upon burning logs, the fire being fed with laths and wood-wool.

Arrangements for Test No. 8.—Twenty-four logs of deal about 5 ft. (1·524 *m.*) in length, 4 in. by 3 in. (·102 by ·076 *m.*) were placed in a pile in Hut No. 3. Laths were placed between the

logs. The interior was filled with laths and wood-wool loosely packed.

Log of Test No. 8.—The fire was lighted in two places and allowed to burn for 1 min. 30 secs.

The flames only attained a slight superficial hold of the logs.

Two large extinguishers were applied by a nominee of the testor at close quarters.

The fire was extinguished with one extinguisher (used intermittently) in 3 min. 10 secs.

The second extinguisher was not exhausted.

All wood-wool was consumed and the laths partially so. The logs were charred on the surface. (See Fig. 6.)

TESTS Nos. 9 AND 9A.

Object of Test No. 9.—This test was undertaken to note the effect of the extinguisher upon burning petrol vapour.

Arrangements for Test No. 9.—Four floor boards were placed together and fastened underneath by cross-battens, the joints were caulked, and a skirting 9 in. by 1 in. (0·229 *m.* by 0·025 *m.*) was fastened around the outside of the boards. They measured 13 ft. long by 2 ft. 4 in. wide (3·962 *m.* by 0·711 *m.*). The whole of the boards were first sprinkled with a pint (0·568 *l.*) of petrol, and then one gallon (4·543 *l.*) was poured on.

Fig. 7. TEST No. 9A (*Arrangement of Test*).

Log of Test No. 9.—The fire was lighted at one point.

One large extinguisher was immediately applied by a nominee of the Committee, first at 6 ft. (1·828 *m.*) distance, and then at close quarters.

Some of the burning spirit was swept off the boards by the force of the extinguisher. A further large extinguisher was applied, but the petrol burnt itself out in 2 min. 29 secs.

Arrangements for Test No. 9A.—The floor boards, with skirting around, as used for Test No. 9, were utilised, but at one end of the

boards was fixed a screen 3 ft. 2in. (0·965 *m.*) high with wings projecting on each side for a distance of 2 ft. (0·610 *m.*). About 2 gallons of petrol (9·087 *l.*) were distributed on the floor.

Log of Test No. 9A.—The fire was lighted at one point. A large extinguisher was immediately applied by a nominee of the Committee and a second extinguisher was afterwards applied. All petrol was consumed. The time was not taken. (*See Fig. 7.*)

TESTS NOS. 10 AND 10A.

Object of Test No. 10.—This test was undertaken to note the effect of the extinguisher upon a burning heap of loose rubbish composed of wood-wool, shavings, hay, straw, waste paper and cotton rags.

Arrangements for Test No. 10.—A heap of rubbish, composed of a quarter bale of wood-wool, half a sack of shavings, a quarter truss of hay, half a bundle of straw, one bushel of waste paper, and one bushel of clean and dry cotton rags were well mixed and loosely stacked on floor of No. 2 Hut.

Log of Test No. 10.—The fire was lighted at two points and allowed to burn for 1 min. 30 sec.

The flames obtained a good hold of the material.

Four large extinguishers were applied by two nominees of the testor (but not at the same time).

After one minute the operator raked the material over.

The fire was checked in 4 min. 55 secs.

The fire was eventually extinguished by water.

Arrangements for Re-test No. 10A.—The arrangements were identical as for Test No. 10.

Log of Test No. 10A.—The flames were lighted at two points and allowed to burn for 1 min. 30 secs.

The flames obtained a good hold of the material.

Three large and one small extinguishers were applied by a nominee of the testor.

The fire was checked in 5 min.

The fire was eventually extinguished by water.

TEST No. 11.

Object of Test No. 11.—This test was arranged to note the effect of the extinguisher upon a bonfire composed of hay, straw, wood-wool and shavings when in an exposed position.

Arrangements for Test No. 11.—A bonfire composed of a quarter truss of hay, half a truss of straw, a quarter bale of wood-wool, and half a sack of shavings well mixed was loosely piled on the roof of Hut No. 1A. The heap measured 6 ft. dia. by 3 ft. 6 in. high (1·828 *m.* by 1·067 *m.*).

Log of Test No. 11.—The fire was lighted at one point and allowed to burn for 1 min. A nominee of the Committee stood on the ground, and at the end of this 1 min. went up the ladder on to the roof and commenced extinguishing operations.

He stood for the first minute at about 13 ft. (3·962 *m.*) distance, and afterwards went to close quarters.

The flames obtained a good hold of the material.

Two large extinguishers were applied.

The operator raked the material over after about 1 min., and finally it was declared out in 3 min. 5 secs. Some while afterwards, however, it burst out again and was extinguished with water.

TEST No. 12.

Object of Test No. 12.—This test was undertaken to note the effect of the extinguisher upon a series of burning heaps of oily rags and dirty cotton waste.

Arrangements for Test No. 12.—A series of six small heaps, each about 1 ft. by 1 ft. (0·3065 by 0·305 m.) high, of oily rags and dirty cotton waste were arranged on the floor of Hut No. 1a, and these were connected by trains of similar material soaked in spirit.

Log of Test No. 12.—The fire was lighted in two places and allowed to progress for 1 min.

The flames obtained good hold of all the heaps.

One large extinguisher was operated by a nominee of the Committee, who stood at first 6 ft. (1·828 *m.*) away, and then worked at close quarters.

The heaps were extinguished in 1 min. 20 secs., but the fire burst out again after an interval and a small part of another extinguisher was applied, when it was finally extinguished.

TESTOR'S DEMONSTRATION TEST A.

Object of Demonstration A.—This Demonstration was undertaken by the testor to exhibit the effect of the extinguisher on a structure 8 ft. 6 in. long by 8 ft. high at front (2·591 by 2·438 *m.*), 7 ft. high (2·134 *m.*) at back by 3 ft. (0·914 *m.*) deep. The whole was well tarred all over, laths were placed upright against the back inside the structure and newspaper fastened to them. Petroleum and petrol were poured over the inner side and the contents of the structure immediately before the test.

Log of Demonstration A.—A match was thrown upon the floor of the structure and soon the whole of the interior was a mass of flame.

The same practically obtained no hold either of the laths or the shelter before the extinguisher was applied.

One large extinguisher was applied by a nominee of the testor and the flames were extinguished. Only a small portion of the contents of the extinguisher was used.

GENERAL ARRANGEMENTS.

The tests were carried out according to the procedure laid down by the Executive for investigations of this description, and were conducted by a Sub-Committee of the Executive comprising :—

Percy Collins, J.P., F.S.S., *Directing Member.*
H. S. Folker (Vice. Pres. Nat. Fire Brigades' Union).
R. W. Henderson, J.P. (Chief Officer, Rickmansworth Fire Brigade).
Ellis Marsland (Dis. Surveyor), *Gen. Hon. Secretary.*
James Sheppard, A.Inst.E.E. (Surveyor North British and Mercantile Insurance Co.).

Mr. A. H. Lister assisted the Sub-Committee.

Note.—Mr. Folker was not present on March 4th; Mr. James Sheppard supervised the Range and Duration tests on March 27th.

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The Executive was represented for the testing operations of February 6th and March 4th by :—

Mr. Edwin O. Sachs, F.R.S.Ed., *Chairman.*

The Committee's Hon. Medical Officer, Surgeon-Major R. J. Maitland Coffin, F.R.C.P., was in attendance on February 6th.

The general body of members was represented for the testing operations of February 6th, 1908, by :—

Messrs. T. F. Britton ; E. J. A. Fulkes (Surveyor, Royal Insurance Co.) ; William Grellier, F.R.I.B.A. (Dist. Surveyor) ; Capt. G. M. Horn (Chief Officer, Clarnico Fire Brigade) ; R. P. Notley, F.R.I.B.A. (Dist. Surveyor) ; Percy E. Ridley, F.S.I., A.Inst.E.E. ; Lieut. S. Sladen, R.N. (Divisional Office, London Fire Brigade) ; H. C. Stoddart ; and David Wm. Wood.

Messrs. The Tea Tray Company, of Newark, N.J. (U.S.A.) and the Underwriters' Fire Appliances, Ltd. (London), were represented on February 6th by :—Messrs. H. J. Bound ; J. Hayward ; O. J. McLoone ; K. Wainwright Robinson ; G. Ruddle ; Walter C. White, and on March 4th by :—Messrs. G. Ruddle and H. B. White, junr.

The following visitors attended at the Testing Station by special invitation of the Executive during the testing operations of February 6th, 1908 :—

Messrs. T. R. Brooke (British Zylonite Co. Ltd.) ; G. T. Bullock (Union Fire Office) ; Bertram Chatterton ; H. Kempton Dyson ; F. Griffiths ; C. F. Merriam (British Zylonite Co., Ltd.) ; E. Merryfield ; Augustus W. Slater (Ambulance Dept., Nat. Fire Brigades' Union) ; and F. G. Stubbings (Fire Dept., Gt. Eastern Railway).

Signed,

For the Sub-Committee conducting the test :—
PERCY COLLINS.

For the General Testing Arrangements Sub-Committee :—
HORACE FOLKER.

For the Executive :—
ELLIS MARSLAND.

Published by the Committee as directed by the Executive.

C. F. ADAMI
(*Assist. Secretary*).

Date.—April 9th, 1908.

Verified a true copy of the Report as ordered to be published.

ROSE, INNES, SON AND CRICK (*Solicitors*).

Date.—April 23rd, 1908.

Lists of the Committee's Publications, Contents of the Committee's Journal, etc., are obtainable upon application to the Assistant Secretary, 1, Waterloo Place, Pall Mall, London, S.W.

J18643

"RED BOOKS" OF THE

BRITISH FIRE PREVENTION COMMITTEE.—No. 127.

Edited by the Executive.

FIRE TESTS

WITH

FIRE EXTINGUISHERS.

FIRE EXTINGUISHERS

Known as the "Diamond" Dry Powder Extinguishers,

SUBMITTED FOR TEST BY

THE DIAMOND FIRE EXTINGUISHER COMPANY, Ltd.,

GLASGOW and LONDON.

The Committee's Report.

LONDON, 1908.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(*Founded 1897—Incorporated 1901*).
1, WATERLOO PLACE, PALL MALL.

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LONDON, 1908.

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(*Founded* 1897—*Incorporated* 1899),
1, WATERLOO PLACE, PALL MALL.

Two Shillings and Sixpence.

418643

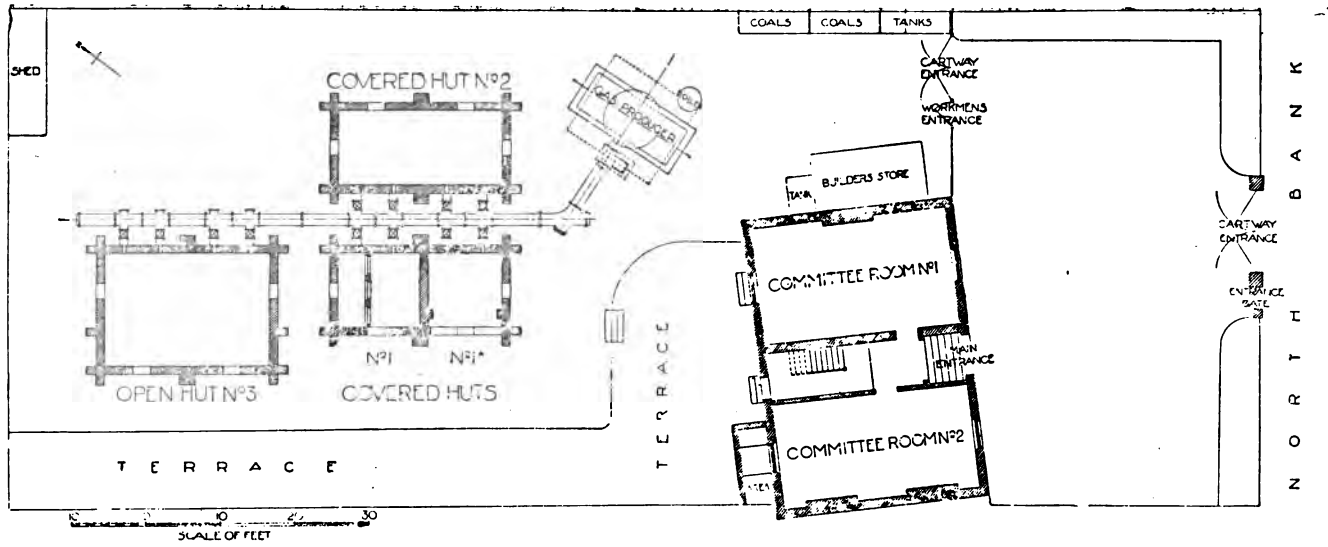

Fig. A. PLAN INDICATING LOCATION OF VARIOUS TESTS.

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SIR JOHN COCKBURN, K.C.M.G., M.D., late Premier of South Australia.
SIR W. MARTIN CONWAY, M.A., F.S.A.
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A. ROSS, M.Inst.C.E., Chief Eng., Great Northern Railway.
ALEXANDER SIEMENS, M.Inst.C.E., Past-Pres. Inst. Electrical Engineers.
SIR JAMES WEEKS SZLUMPER, M.Inst.C.E.
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SIR JOHN TAYLOR, K.C.B., Consulting Architect, H.M. Office of Works.
ROBERT VIGERS, Past President the Surveyors' Institution.
ARTHUR WHITELEGGE, C.B., M.D., Chief Inspector of Factories, Home Office.
SIR JAMES WILLIAMSON, C.B., late Director of H.M. Dockyards.
SIR HENRY TRUEMAN WOOD, M.A., Secretary Society of Arts.

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J. HERBERT DYER, Sen. Vice-Pres. Nat. Fire Brigades' Union;
CHARLES E. GOAD, M.Am.Soc.C.E.;
J. W. RESTLER, M.Inst.C.E., Dep.-Chief Eng. Metropolitan Water Board;
JAMES SHEPPARD, A.Inst.E.E., Surveyor North British and Merc. Ins. Co.;
OSWALD C. WYLSON, F.R.I.B.A.

Gen. Hon. Secretary:

ELLIS MARSLAND, District Surveyor.

Hon. Auditors:

HORACE S. FOLKER, F.A.I., Vice-Pres. Nat. Fire Brigades' Union.
R. J. MAITLAND-COFFIN, F.R.C.P., Surg.-Major.

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LONDON AND SOUTH WESTERN BANK,
Regent Street, London, W.

Offices:

WATERLOO PLACE, PALL MALL, LONDON, S.W.

CHARLES ADAMI, *Assistant Secretary.*

Fig. 1. TEST NO. 1 (*View before Test*).
(*See page* 12.)

Fig. 2. TEST NO. 1 (*View after Test*).
(*See page* 12.)

NOTE.

The series of tests with the "Diamond" Dry Powder extinguisher showed that hand powder fire extinguishers, as a class, if applied with skill, can often be usefully employed in the incipient stages of small fires. If a small fire has obtained such proportions that it cannot be extinguished by a number of hand powder fire extinguishers, they may still be useful to keep it in check until other fire appliances can be brought into play—this applies especially to loose material.

The various tests undertaken with petrol point to the conclusion that, with a volatile liquid of this nature giving off a highly inflammable vapour, the powder extinguisher is only efficient when the area of the fire is small or narrow.

The efficiency of powder extinguishers depends materially on the closeness of range, the position of the operator's shoulder, and on a certain knack or dexterity in handling the appliance.

The action of powder extinguishers would appear to be largely mechanical.

PERCY COLLINS.

1, WATERLOO PLACE,
LONDON, S.W.
17th June, 1908.

Fig 4 TEST NO. 4 (*View after Test*).

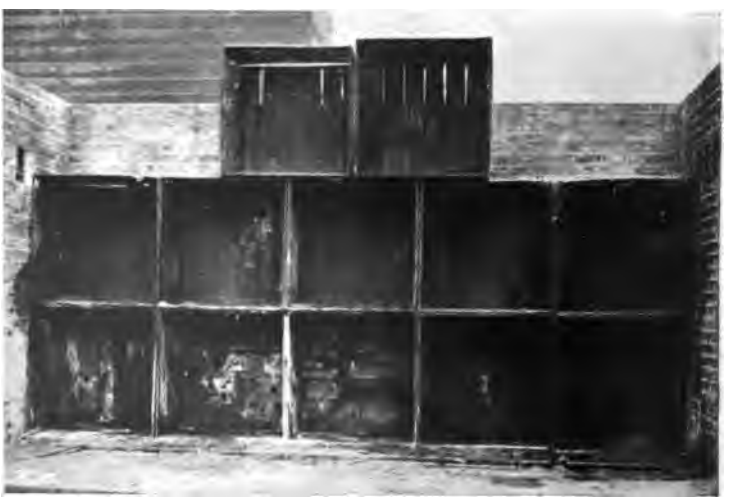

Fig. 5. TEST NO. 4A (*View after Re-Test*).

OFFICIAL REPORTS

OF THE

British Fire Prevention Committee

[FOUNDED 1897—INCORPORATED 1899].

FIRE TEST No. 94.—MARCH 4TH, 1908.

FIRE EXTINGUISHERS

KNOWN AS THE

"DIAMOND" DRY POWDER EXTINGUISHERS

SUBMITTED FOR TEST BY

DIAMOND FIRE EXTINGUISHER COMPANY, LTD.

GLASGOW AND LONDON.

OBJECTS OF TESTS.

To ascertain the effect of the application of "Diamond" Dry Powder Fire Extinguishers (supplied by the testor) upon various burning materials both in a room and in the open.

Note.—The tests comprised supplementary tests ordered by the Committee. The tests were in certain instances followed by *re-tests*, ordered by the Committee.

The following tests were applied :—

THE TESTS APPLIED.

The Committee's Tests.

TEST No. 1.—This test was undertaken to note the effect of the extinguisher upon a fire which was started at a dressing table in a bedroom with curtains, etc., above, the dressing table being draped with loose material and having inflammable articles lying thereon.

TEST No. 2.—This test was undertaken to note the effect of the extinguisher upon burning hay in a raised wooden rack in a stable.

TEST No. 3.—This test was undertaken to note the effect of the extinguisher upon a burning crate of loose wood-wool, such as might be found in a packing room of a wholesale or retail store.

TESTS Nos. 4 AND 4A.—These tests were undertaken to note the effect of the extinguisher upon a stack of twelve packing cases, stacked against a wall, open face outwards and each containing a small quantity of inflammable material such as would be used for packing.

TEST No. 5.—This test was undertaken to note the effect of the extinguisher upon a pyramidical stack of burning wood with wood-wool filled in.

TEST No. 6.—This test was undertaken to note the effect of the extinguisher upon a burning heap of straw and small pieces of soft wood damped with water.

TEST No. 7.—This test was undertaken to note the effect of the extinguisher upon burning celluloid.

TEST No. 8.—This test was undertaken to note the effect of the extinguisher upon burning logs, the fire being fed by laths and wood-wool.

TESTS Nos. 9, 9A, 9B, 9B1, 9C, 9C1, 9C2, 9D, 9D1, 9E, 9E1, 9F, 9G, 9G1, 9G2, 9H, 9I and 9J.—These tests were undertaken to note the effect of the extinguisher upon burning petrol.

TEST No. 10.—This test was undertaken to note the effect of the extinguisher upon a burning heap of loose rubbish composed of wood-wool, shavings, hay, straw, waste paper and cotton rags.

TEST No. 11.—This test was arranged to note the effect of the extinguisher upon a bonfire composed of hay, straw, wood-wool and shavings when in an exposed position.

TEST No. 12.—This test was undertaken to note the effect of the extinguisher upon a series of burning heaps of oily rags and dirty cotton waste.

Note.—Tests Nos. 4A, 9A, 9B1, 9C1, 9C2, 9D1, 9E1, 9G1 and 9G2 were retests by Order of the Committee.

SUMMARY OF THE TESTS.

The following is a summary of the results of the tests ordered by the Committee :—

The tests demonstrated that the extinguishers, when properly handled and in sufficient number, were efficient in checking small fires in their early stages.

Where the material ignited was soft and loose, difficulty was always apparent in stopping the smouldering which ensued.

Where petrol or petrol vapour was ignited over a small area (not exceeding 4 sq. ft.) the extinguishers were uniformly effective.

The efficiency depended materially on the closeness of range, and the position of the operator's shoulder being above the seat of the fire, and dexterity in throwing the powder.

The following table summarises the number of extinguishers used, the time occupied in their application, the distance at which they were operated, and the effect noted :—

Test or Re-test.	Number of Extinguishers.	Time occupied. min.	Time occupied. secs.	Distance of Operator. At first.	Distance of Operator. At end.	Remarks.
No. 1	3	0	28	12 ft.	(3·657 *m.*)	Practically out in 28 secs.
,, 2	10	5	30	12 ft. (3·657 *m.*)	at close qtrs.	Fire checked in 5 mins. 30 secs., but broke out again and was put out eventually by water.
,, 3	12	2	22	6 ft. (1·828 *m.*)	at close qtrs.	Fire checked, and after being raked over was extinguished
,, 4	26	4	15	15 ft. (4·572 *m.*)	at close qtrs.	Fire nearly out.
,, 4A	18	5	45			Fire checked. Fire eventually put out by water.
,, 5	14	3	15	at close	quarters	Fire practically out.
,, 6	4	1	10	at close	quarters	Fire out in 1 min. 13 secs.
,, 7	4	0	27	6 ft. (1·828 *m.*)	at close qtrs.	Fire out in 27 secs.
,, 8	18	2	40	at close	quarters	Fire was nearly subdued in 2 mins. 40 secs. The loose material afterwards burnt itself out.
,, 9	6	0	52	6 ft. (1·828 *m.*)	at close qtrs.	Fire out, petrol nearly all consumed.
,, 9A	*Numerous*	2	31	Ditto	Ditto	Ditto
* ,, 9B & 9B1	1	0	2av	6 ft. (1·828 *m.*)	at close qtrs.	The fire was extinguished with 2 throws of the powder.
† 9C, 9C1 & 9C2	1	0	5½v.	6 ft. (1 828 *m.*)	at close qtrs.	The fire was extinguished with 2 to 3 throws of the powder.
,, 9D	1	0	5	6 ft. (1·828 *m.*)	at close qtrs.	The fire was extinguished with 3 to 4 throws of the powder.
,, 9D1	1	0	20	Ditto	Ditto	Ditto
,, 9E	4	0	29	6 ft. (1·828 *m.*)	at close qtrs.	The flames were extinguished.
,, 9E1	1	0	2	Ditto	Ditto	Ditto
,, 9F	9	1	53	6 ft. (1·828 *m.*)	at close qtrs.	Not extinguished. Eventually put out by wet sacks and sand.
,, 9G	3	0	18½	6 ft. (1·828 *m.*)	at close qtrs.	The flames were extinguished.
,, 9G1	8	1	13½	Ditto	Ditto	Ditto
,, 9G?	—	2	31	Ditto	Ditto	Not extinguished. Eventually put out with sand, etc.
,, 9H	2		—	6 ft. (1·828 *m.*)	at close qtrs.	The flames were extinguished.
,, 9I	3	0	22	6 ft. (1·828 *m.*)	at close qtrs.	The flames were extinguished.
,, 9J	8	1	40	6 ft. (1·828 *m.*)	at close qtrs.	Not extinguished. Eventually put out with wet sacks.
,, 10	—	0	55	6 ft. (1·828 *m.*)	at close qtrs.	Not extinguished. Eventually put out by water.
,, 11	15	3	15	13 ft. (3·962 *m.*)	at close qtrs.	Fire nearly out. Eventually put out by water.
,, 12	10	1	54	6 ft. (1·828 *m.*)	at close qtrs.	Fire practically out in 1 min. 54 secs., the operator raking the material over.

NOTE :—Each extinguisher contained about 2 pints (1·136 *l.*) of material.
* See log for details; two identical tests. † Ditto ; three identical tests.

CONDITIONS OF TEST.

The following rules were laid down by the Executive and served as a guide for the tests :—

The tests will generally be taken in numerical order, subject to alteration by the directing member.

Tests will, where considered advisable by the Sub-Committee, be repeated at their discretion (known as re-tests).

The extinguisher will be applied at the desire of the Sub-Committee either by a member of the Committee or the testor, or by a nominee of either.

The Committee provide material for certain tests as may be directed by the Sub-Committee and the testor for the others, but the Sub-Committee may replace the material provided by the testor by their own or use their own at re-tests.

The fire having been allowed to progress at the discretion of the directing member, the extinguisher will be applied from a position and at a distance pointed out by him, a time limit being set to each test at his discretion.

Directly the number of extinguishers specified have been used or the time limit has been reached, a whistle will be sounded and the test stopped, and any fire remaining will be extinguished otherwise than by extinguishers.

Directly a fire has been extinguished by an extinguisher, a whistle will be sounded and the test stopped.

The party extinguishing a fire must not touch the material under test, unless by direction of the directing member.

The contents of any extinguisher on the ground may be reserved for analysis, and any extinguisher, or extinguishers reserved for examination.

The arrangements are subject to alteration by the directing member.

The testor may put forward four "Demonstration" tests for the cognisance of the Sub-Committee, making his own arrangements and providing his own materials, but the Sub-Committee shall, if it considers advisable, order these tests to be repeated or repeated with variations to serve as Counter-Demonstrations.

DESCRIPTION OF APPLIANCE.

(Taken from the Maker's Description).

The appliance consists of a metal tube 22 in. (0·56*m.*) long, 2 in. (·051 *m.*) diameter, closed at one end, the other end fitted with a press-cap, having a strong ring attached.

The tube is filled with a powder stated to be a secret composition, the powder being of a very finely ground character.

The appliance is operated by pulling the tube downwards away from the cap, the ring of which is supposed to be hung to a nail or hook. The contents of the appliance is then thrown on to the fire in short jerky throws.

THE POWDER EXTINGUISHER.

The testor states that the following model was under test :—

Model, made of tin, enamelled red on the outside.

Containing	2 pints	(1·136 *l.*)
Weight, unfilled	8½ ozs.	(0·241 *kg.*)
Weight, filled	3 lbs.	(1·361 *kg.*)

Measurement : height 22 in., dia. 2 in. (0·56 *m.* and 0·051 *m*)

The charge in all cases comprised a charge of so-called "Diamond" powder.

RANGE OF THE APPLIANCE.

The following extinguishers were tested for range and duration of action on March 4th :—

An extinguisher (delivered charged) ; range of action in form of a cloud of fine dust 17 ft. to 20 ft. (5·181 *m.* to 6·1 *m.*).

DESCRIPTION OF TESTING PLANT.

The tests were conducted at the Committee's Testing Station at North Bank, Regent's Park.

Of the tests, Nos. 5, 9, 9A to 9J and 11, were undertaken in the open and tests Nos. 1, 2, 3, 4, 4A, 6, 7, 8, 10, and 12 in the testing chambers of the Committee.

Testing Chambers, Nos. 1, 1A, 2 and 3 were used.

Test No. 2 was undertaken in Hut No. 1 ; tests Nos. 3, 7 and 12 in Hut No. 1A ; tests Nos. 1, 6, 10 in Hut No. 2 ; and tests Nos. 4, 4A and 8 in Hut No. 3. Of the tests in the open test No. 11 was taken on the top of Hut No. 1A.

Testing Chamber No. 1 was a covered hut measuring 10 ft. by 10 ft. by 8 ft. high (3·048 by 3·048 by 3·048 by 2·438 *m.*). Testing Chamber No. 1A was a covered hut with its front open and measured 10 ft. by 10 ft. by 6 ft. 11 in. (3·048 by 3·048 by 2·717 *m.*) Testing Chamber No. 2 was a covered hut measuring 22 ft. 3 in., by 10 ft. by 8 ft. 3 in. (6·781 by 3·048 by 2·514 *m.*). Testing Chamber No. 3 was an open hut without roof, measuring 22 ft. 3 in. by 15 ft. floor surface (6·781 by 4·572 *m.*).

Note.—The materials for the Committee's tests were of the ordinary description and were provided by the Committee, with the exception of the materials for tests 4, 4A, 8, 9A-9J, which were provided by the testor.

PREPARATION FOR AND CONDUCT OF THE TESTS.

The tests were undertaken on March 4th, 1908.

The weather on March 4th was fine. The wind N. The Barometer at 3 p.m. at the Botanical Gardens registered 29.69 and the Thermometer 51°.

The tests took place from 1-30 p.m. to 5.15 p.m.

All the extinguishers used were provided by the testor and delivered filled (charged) and closed, to the testing station.

The Directing Member of the Sub-Committee decided *ad hoc* immediately before the commencement of each test or re-test, whether a nominee of the testor or of the Committee should operate the appliances. The nominees of the testor were in every case members of his permanent staff; the nominees of the Committee were either members or officials of the Committee or visitors.

THE OBJECT OF CONDITIONS AND ARRANGEMENTS FOR THE TESTS, WITH THE LOG OF EACH TEST.

TEST No. 1.

Object of Test No. 1.—This test was undertaken to note the effect of the extinguisher upon a fire which was started at a dressing table in a bedroom with curtains &c. above, the dressing table being draped with loose material and having inflammable articles lying thereon.

Arrangements for Test No. 1.—Against the south wall of Hut No. 2 was placed a small deal table which had a covering and valance of figured muslin. On the table were celluloid combs, boxes, and a hand glass. On the right of the table was a cane-seated chair, and on the left a similar chair and a wicker basket containing waste paper. Above the table was a wooden cornice with valance and pole, over which were hung two pairs of lace curtains with two paper fly-catchers. The wall of the back of the table and the two side walls for some few feet on either side were papered.

Log of Test No. 1.—The waste paper in the basket was lighted and the fire was allowed to burn for 1 min.

The flames obtained a fair hold of the materials.

Three extinguishers were applied by a nominee of the testor who stood 12 ft. (3·657 *m.*) away.

The fire was extinguished in 28 secs., but a little smouldering remained.

The paper basket and the paper were burnt. The window curtains on the left side and one fly-catcher were consumed and also one celluloid hair comb. (*See Figs.* 1 *and* 2).

TEST No. 2.

Object of Test No. 2.—This test was undertaken to note the effect of the extinguisher upon hay in a raised wooden rack in a stable.

Arrangements for Test No. 2.—Opposite the door in west side of Hut No. 1 was placed a wooden erection to represent a hay rack in a stable. This rack was composed of light strips of wood, fixed 3 ft. 4 in. (0.483 *m.*) above the floor. It was 5 ft. 8 in. (1·727 *m.*) long, 2 ft. 4 in. (0·711 *m.*) deep, and 3 ft. (0·914 *m.*) from back to front. The back and one end were formed by the brickwork of the hut; the front, bottom, and one end, of wood strips. Half a truss of hay was placed loosely in the rack.

Log of Test No. 2.—The hay was lighted at one point and allowed to burn for 1 min.

The flames obtained a good hold of the hay.

Ten extinguishers were applied by a nominee of the testor, who stood at first 12 ft. (3·657 *m.*) away, but afterwards went inside the hut, and worked intermittently at close quarters.

The flames were held in check for 5 mins. 30 secs., but smouldering continued and fire broke out which was eventually put out by water.

TEST No. 3.

Object of Test No. 3.—This test was undertaken to note the effect of the extinguisher upon a burning crate of loose wood-wool, such as might be found in a packing room of a wholesale or retail store.

Arrangements for Test No. 3.—A lightly made crate, composed of strips of wood and measuring 4 ft. by 3 ft. 3 in. by 1 ft. 10 in. (1·219 *m.* by 0·991 *m.* by 0·558 *m.*) deep, was loosely filled with wood-wool. The crate was raised about 5 in. (·127 *m.*) from the floor of Hut No. 1a, being stood on four bricks.

Log of Test No. 3.—The fire was lighted in two places and allowed to burn for 52 secs.

The flames had obtained complete hold of the wood-wool, and had slightly charred the crate.

Twelve extinguishers were applied by a nominee of the testor, who stood 6 ft. (1·828 *m.*) away for 38 secs., and thereupon worked at close quarters.

The fire was checked and after being slightly raked over was extinguished in 2 mins. 22 secs.

TESTS Nos. 4 AND 4A.

Object of Tests Nos. 4 AND 4A.—These tests were undertaken to note the effect of the extinguisher upon a stack of twelve packing cases stacked against a wall, open face outwards and each containing a small quantity of inflammable material such as would be used for packing.

Arrangements for Tests Nos. 4. AND 4A.—Twelve wooden cases, each measuring about 3 ft. (0·914 *m.*) square by 2 ft. deep, (0·609 *m.*) were piled up against the north wall of Hut No. 3, facing south. Some small pieces of laths and a little wood-wool was strewn about inside the cases. (*See Fig.* 4.)

Log of Test No. 4.—The fire was lighted at two points and allowed to burn for 45 secs. The flames obtained a fair hold of the inside of most of the cases.

Twenty-six extinguishers were applied by a nominee of the Committee, first at 15 ft. (4·572 *m.*) away, and then at close quarters. The fire was nearly extinguished in 4 mins. 15 secs.

Log of Re-Test No. 4A.—The fire was allowed to burn for 45 secs. Eighteen extinguishers were used in 5 mins. 45 secs. by a nominee of the testor, but the boxes caught alight and were eventually put out by water. (*See Fig.* 5.)

Nearly all the shavings and loose material were consumed and the interior charred. (*See Fig.* 4.)

TEST No. 5.

Object of Test No. 5.—This test was undertaken to note the effect of the extinguisher upon a pyramidical stack of wood with wood-wool filled in.

Arrangements for Test No. 5.—A pyramidical stack of wood was erected in the open, about 12 ft. (3·657 *m.*) high and about 6 ft. (1·828 *m.*) in diameter at base and filled in with some small pieces of wood, laths and wood-wool. (*See Fig.* 6.)

Log of Test No. 5.—The fire was lighted at two points and allowed to progress for 1 min.

Fourteen extinguishers was used by a nominee of the testor, who applied them at close quarters all round the pyramid.

The fire was practically extinguished in 3 mins. 15 secs.

All wood-wool and loose material was consumed and the wood charred.

Fig. 6. TEST No. 5 (*View after Test.*)

TEST No. 6.

Object of Test No. 6.—This test was undertaken to note the effect of the extinguisher upon a burning heap of straw and small pieces of soft wood damped with water.

Arrangements for Test No. 6.—A bushel of small pieces of soft wood was mixed with half a truss of straw and loosely stacked on floor of Hut No. 1, forming a heap about 2 ft. high (0·609 *m.*) and 4 ft. (1·219 *m.*) in diameter and one gallon (4·543 *l.*) of water sprinkled over same.

Log of Test No. 6.—The fire was lighted at one point and was allowed to progress for 2 mins.

Four extinguishers were applied at close quarters by a nominee of the testor for 30 secs. and the fire was extinguished in 1 min. 10 secs.

A little over one-half of the straw was consumed.

TEST No. 7.

Object of Test No. 7.—This test was undertaken to note the effect of the extinguisher upon burning celluloid.

Arrangements for Test No. 7.—A circular heap of celluloid shavings, scraps and dust, measuring about 2 ft. diameter by about 1 ft. high (0·609 *m.* by 0·305 *m.*) in the centre, was placed on the floor of Hut No. 1a.

Log of Test No. 7.—The fire was lighted at one point.

The flames immediately obtained a good hold of the celluloid.

Four extinguishers were applied by a nominee of the testor standing 6 ft. (1·828 *m.*) away, and afterwards approaching to close quarters.

In 27 secs. the fire was put out.

A small quantity of the celluloid was not consumed, but covered by the powder of the extinguisher. It was afterwards set alight, and allowed to burn itself out.

TEST No. 8.

Object of Test No. 8.—This test was undertaken to note the effect of the extinguisher upon burning logs, the fire being fed by laths and wood-wool.

Arrangements for Test No. 8.—Twenty-four logs of deal about 5 ft. (1·524 *m.*) in length, 4 in. by 3 in. (·102 by ·076 *m.*) were placed in a pile in Hut No. 3. Laths were placed between the logs. The interior was filled with laths and wood-wool loosely packed.

Log of Test No. 8.—The fire was lighted in two places and allowed to burn for 1 min. 15 secs.

The flames only attained a slight superficial hold of the logs.

Eighteen extinguishers were applied by a nominee of the testor at close quarters.

The fire was nearly subdued in 2 mins. 40 secs.; it burnt up again 2 mins. after and was left to burn itself out.

All wood-wool and the laths were consumed. The logs were charred on the surface. (See Fig. 7.)

TESTS Nos. 9 AND 9A.

Object of Test No. 9.—This test was undertaken to note the effect of the extinguisher upon burning petrol vapour.

Arrangements for Test No. 9.—Four floor boards were placed together and fastened underneath by cross-battens, the joints were caulked, and a skirting 9 in. by 1 in. (0·229 *m.* by 0·025 *m.*) was fastened around the outside of the boards. They measured 13 ft. long by 2 ft. 4 in. wide (3·962 *m.* by 0·711 *m.*). The whole of the boards were first sprinkled with a pint (0·568 *l.*) of petrol, and then one gallon (4·543 *l.*) was poured on.

Log of Test No. 9.—The fire was lighted at one point.

Six extinguishers were immediately applied by a nominee of the testor, first at 6 ft. (1·828 *m.*) distance, and then at close quarters.

Fig. 7. TEST NO. 8. (*View after Test.*)

The flames were extinguished in 52 secs. and it was found afterwards, when the lights were applied, that there was some petrol left on the boards.

Arrangements for Re-Test 9A.—The arrangements were identical as for Test No. 9, but a screen was used at one end of the floor boards.

Log of Re-Test 9A.—A large number of extinguishers* were used in 2 mins. 31 secs. The fire was extinguished. The petrol was nearly all consumed.

TESTS NOS. 9B TO 9J.

Object of Test 9B.—This test was undertaken by the Committee to note the effect of the extinguisher on petrol in an ordinary bucket.

Arrangements for Test 9B.—About 1 inch (·025 *m.*) deep of petrol was placed in a common pail. A light was thrown in and the petrol vapour ignited.

Log of Test 9B.—An extinguisher was applied by a nominee of the testor. The flame was suffocated with two throws of the powder.

Log of Re-Test 9B1.—The test was repeated with like result with one throw.

The average time of the two tests (Nos. 9B and 9B1) was 2 secs.

* Record of number doubtful and thus not published.

Object of Test 9C *to* 9J.—These tests were undertaken to show the effect of the extinguisher upon burning petrol vapour in vessels of varying area, depth and section. (*See Fig.* 8.)

Arrangements for Test 9C.—A galvanised iron tank 18 in. (0·457 *m.*) diameter and 2 ft. (0·610 *m.*) deep was used in which was placed half a gallon (2·272 *l.*) of petrol.

Log of Test 9C.—The petrol vapour was ignited and extinguisher immediately used by a nominee of the testor. The fire was extinguished with three throws of the powder.

Log of Re-Tests 9C1 *and* 9C2.—This test was twice repeated with like result with two throws.

The average time was 5½ secs. in the 3 tests.

Arrangements for Test 9D.—The same vessel as for 9C1 and 9C2 was employed. Two gallons (9·087 *l.*) of petrol were placed in the tank, but all round the inside of the tank was well wetted with petrol.

Log of Test 9D.—The vapour was ignited and the fire was quenched with four throws of the powder in 5 secs.

Log of Re-Test 9D1.—This test was repeated, the fire being allowed to burn for 1 min. with a like result with three throws of the powder in 20 secs.

Fig. 8. TESTS NOS. 9C TO 9J. (*The Vessels, etc., Used.*)

Arrangements for Test 9E.—A galvanised iron V-shaped trough 2 ft. by 4 ft. (0·610 *m.* by 1·219 *m.*) by 18 in. (0·457 *m.*) deep sloped downwards at the angles so that the bottom of the V was 2 ft. long (0·610 *m.*) was placed on the ground in which were placed 2 gallons (9·087 *l.*) of petrol.

Log of Test 9E.—A lighted match was thrown on and four extinguishers were applied by a nominee of the testor and the flames were quenched in 29 secs.

Log of Re-Test 9E1.—This test was repeated with the petrol that remained in the trough, the fire being allowed to burn for 1 min. The fire was extinguished with one extinguisher in 2 secs.

Arrangements for Test 9F.—A galvanised iron tank 3 ft. by 3 ft. (0·9143 *m.* by 0·9143 *m.*) by 6½ in. deep (0·1651 *m.*) was placed on the ground. 4 gallons (18·174 *l.*) were put in, the depth of petrol being about ¾ in. (·0190 *m.*).

Log of Test 9F.—A lighted match was thrown on to the surface of the petrol. Nine extinguishers were applied by a nominee of the testor in 1 min. 53 secs. The flames gained in fierceness, and were put out eventually with wet sacks and sand thrown on.

Arrangements for Test 9G.—A galvanised iron tank splayed at ends, 1 ft. 6 in. (0·4571 *m.*) wide, 2 ft. 11 in. long at top (0·8888 *m.*) and 1 ft. 5½ in. long at bottom (0·4444 *m.*), 1 ft. (0·3047 *m.*) deep, was placed on the ground. 2 gallons (9.087 *l.*) of petrol were put in, the depth of petrol being about 1½ in. (·0380 *m.*) (*See Fig.* 8.)

Log of Test 9G.—A lighted match was thrown on the surface of the petrol. Three extinguishers were applied by a nominee of the testor, and the flames were extinguished in 18½ secs.

Log of Re-Tests 9G1 *and* 9G2.—This test was repeated, the fire being allowed to burn for 1 min. The flames were extinguished with 8 extinguishers in 1 min. 13½ secs. The test was again repeated, the flames were partially subdued in 15 secs., whereupon the fire broke out again with fierceness, and was eventually put out with sand, etc.

Arrangements for Test 9H.—A galvanised iron tank tapered at ends, 1 ft. 6in. wide (0·4571 *m.*), 2 ft. 6 in. long at top, and 1 ft. 5½ in. at bottom (0·7619 *m.*) and (0·4444 *m.*), 8 in. (·2032 *m.*) deep, was placed on the ground. 1 quart (1·136 *l.*) of petrol was put in. (*See Fig.* 8.)

Log of Test 9H.—A lighted match was thrown on the surface of the petrol. Two extinguishers were immediately applied by a nominee of the testor. The flames were extinguished in (?) secs.*

Arrangements for Test 9I.—A wooden platform made of ordinary floor boards and battened below, measuring about 6 ft. by 6 ft. (1·828 by 1·828 *m.*) was placed on the ground and about 2 pints (1·136 *l.*) of petrol poured on.

Log of Test 9I.—The vapour was ignited by a match thrown on and three extinguishers applied in 22 secs. The flames were extinguished and a very small quantity of petrol was found to be still unconsumed.

Arrangements for Test 9J.—A galvanised iron tank 2 ft. by 2 ft. (0·61 *m.* by 0·61 *m.*), by 6 in. (0·152 *m.*) deep was placed on the ground, 1 gallon (4·543 *l.*) of petrol being put in.

Log of Test 9J.—A light was applied, and the vapour burned fiercely for some time. 8 extinguishers were applied without effect in 1 min. 20 secs. The fire was extinguished eventually with wet sacks thrown on.

TEST No. 10.

Object of Test No. 10.—This test was undertaken to note the effect of the extinguisher upon a burning heap of loose rubbish composed of wood-wool, shavings, hay, straw, waste paper and cotton rags.

Arrangements for Test No. 10.—A heap of rubbish, composed of a quarter bale of wood-wool, half a sack of shavings, a quarter truss of hay, half a bundle of straw, one bushel of waste paper and one bushel of clean and dry cotton rags were well mixed and loosely stacked on floor of No. 2 Hut.

Log of Test No. 10.—The fire was lighted at two points and allowed to burn for 1 min. 15 secs.

The flames obtained a good hold of the material.

The heat and smoke made such headway before the nominee of the testor could bring the appliances into effective use, that he declared it impossible to stay in the hut to extinguish the fire, which was raked over after 55 secs., and was thereupon put out by water.

* Stop watch failed.

TEST No. 11.

Object of Test No. 11.—This test was arranged to note the effect of the extinguisher upon a bonfire composed of hay, straw, wood-wool and shavings when in an exposed position.

Arrangements for Test No. 11.—A bonfire composed of a quarter truss of hay, half a truss of straw, a quarter bale of wood-wool, and half a sack of shavings well mixed was loosely piled on the roof of Hut No. 1A. The heap measured 6 ft. by 3 ft. 6 in. high (1·828 *m.* by 1·067 *m.*).

Log of Test No. 11.—The fire was lighted at one point and allowed to burn for 1 min. A nominee of the testor stood on the ground, and at the end of this 1 min. went up the ladder on to the roof and commenced extinguishing operations.

He stood for the first minute at about 13 ft. (3·962 *m.*) distance, and afterwards went to close quarters.

The flames obtained a good hold of the material.

The fire was almost extinguished at the end of 2 mins. 35 secs.

Fifteen extinguishers were used.

The operator raked the material over after about 1 min., and the fire was finally put out by stamping out and by water after 3 mins. 15 secs.

TEST No. 12.

Object of Test No. 12.—This test was undertaken to note the effect of the extinguisher upon a series of burning heaps of oily rags and dirty cotton waste.

Arrangements for Test No. 12.—A series of six small heaps, each about 1 ft. by 1 ft. (0·3065 by 0·305 *m.*) high, of oily rags and dirty cotton waste were arranged on the floor of Nut No. 1a, and these were connected by trains of similar material soaked in spirit.

Log of Test No. 12.—The fire was lighted in two places and allowed to progress for 1 min. 45 secs.

The flames obtained good hold of all the heaps.

Ten extinguishers were operated by a nominee of the Committee who stood at first 6 ft. (1·828 *m.*) away, and then worked at close quarters.

The heaps were finally extinguished in 1 min. 54 secs., the operator raking the material over.

GENERAL ARRANGEMENTS.

The tests were carried out according to the procedure laid down by the Executive for investigations of this description, and were conducted by a Sub-Committee of the Executive comprising :—

Percy Collins, J.P., F.S.S. (*Directing Member*).
Ellis Marsland (Dist. Surveyor), *Gen. Hon. Secretary.*
James Sheppard, A.Inst.E.E. (Surveyor, North British and Mercantile Insurance Co.).
J. Herbert Dyer (Senior Vice-Pres. Nat. Fire Brigades' Union).
Capt. R. W. Henderson (Chief Officer, Rickmansworth Fire Brigade).

418643

The Executive were represented for the Testing operations of March 4th by :—

Mr. Edwin O. Sachs, F.R.S.Ed. (Chairman).
Mr. Chas. E. Goad, M.Am.Soc.C.E.

The general body of members were represented for the testing operation of March 4th, 1908, by :—

Messrs. T. F. Britton ; S. Flint Clarkson, F.R.I.B.A. (Dist. Surveyor) ; William Coxeter (Abingdon Fire Brigade) ; E. J. Fulkes (Surveyor, Royal Insurance Co.) ; S. G. Gamble, A.M.Inst.C.E. (Divisional Officer, London Fire Brigade) ; Louis T. Healy, A.Inst.E.E. (Royal Insurance Co.) ; Percy E. Ridley, F.S.I. ; H. Charles Stoddart ; Lieut. S. Sladen, R.N. (Divisional Officer, London Fire Brigade).

Messrs. Diamond Fire Extinguisher Co. were represented on March 4th by :—

Messrs. P. E. Parr ; Robert Paterson, C.A. ; Joseph Whaley.

The following visitors attended at the Testing Station by special invitation of the Executive during the Testing operations of March 4th, 1908 :—

Messrs. T. R. Brooke (British Xylonite Co.) ; P. W. Bullock ; T. S. Bower ; G. T. Bullock (Union Assurance Co.) ; G. H. Beaman (Guardian Assurance Co.) ; Carr —. (Midland Rly.) ; H. K. Dyson. G. T. Hodgson ; Chief Officer Levy (Rochester Fire Brigade) ; Joseph Longbottom ; C. P. Merriam ; Station Officer E. W. Noel (London Fire Brigade) ; A. J. Orr (British Luxfer Prism Syd, Ltd.) ; Ellis Parr ; F. G. Stubbings (Fire Dept. Gt. Eastern Railway) ; and Augustus W. Slater (2nd Officer, Ambl. Dept. N.F.B.U.)

Signed,

For the Sub-Committee conducting the test :—
PERCY COLLINS.

For the General Testing Arrangements Sub-Committee :—
JAMES SHEPPARD.

For the Executive :—
ELLIS MARSLAND.

Published by the Committee as directed by the Executive.

C. F. ADAMI (*Assist. Secretary*).

Date.—June 24th, 1908.

Verified a true copy of the Report as ordered to be published.

ROSE, INNES, SON AND CRICK (*Solicitors*).

Date.—June 27th, 1908.

Lists of the Committee's Publications, Contents of the Committee's Journal, etc., are obtainable upon application to the Assistant Secretary, 1, Waterloo Place, Pall Mall, London, S.W.

"RED BOOKS" OF THE

BRITISH FIRE PREVENTION COMMITTEE.—No. 128.

Edited by the Executive.

463126

FIRE TESTS

WITH

FIRE EXTINGUISHERS

BUCKETS OF WATER, HAND PUMPS, Etc., AS IN COMMON USE.

PARTICULARS OF EXPERIMENTAL TESTS.

ALL RIGHTS RESERVED.

LONDON, 1908.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(Founded 1897—Incorporated 1899),
1, WATERLOO PLACE PALL MALL.

"*RED BOOKS*" *of the*

BRITISH FIRE PREVENTION COMMITTEE.—No. 128.

Edited by the Executive.

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1, WATERLOO PLACE, PALL MALL.

Two Shillings and Sixpence.

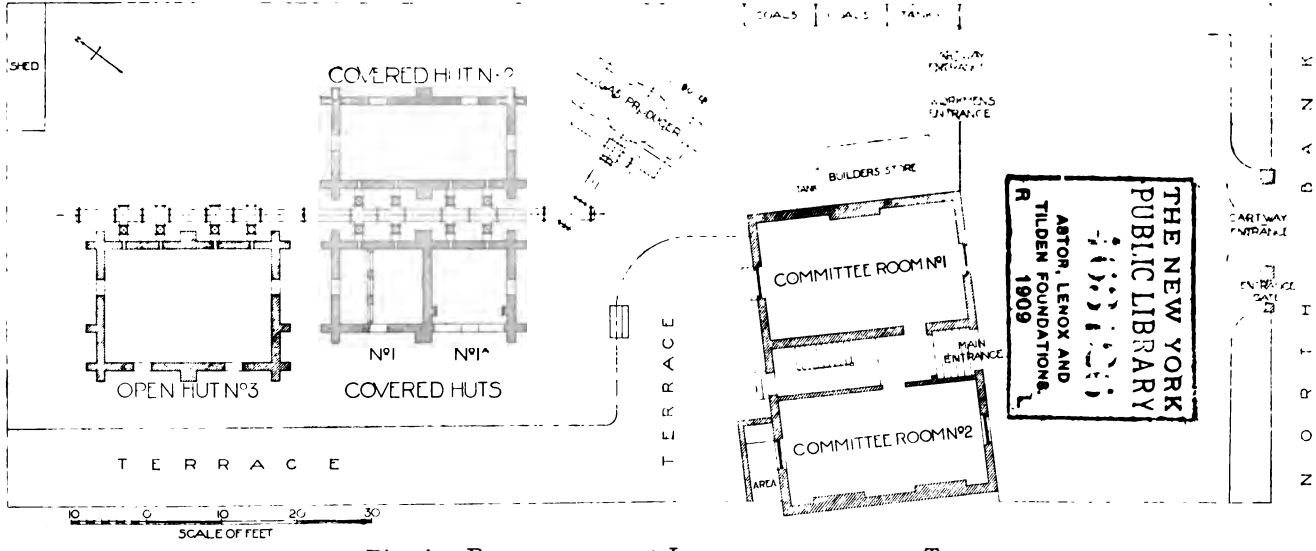

Fig. A. PLAN INDICATING LOCATION OF VARIOUS TESTS.

COUNCIL.

Chairman of the Executive:

EDWIN O. SACHS, F.R.S.Ed. F.F.S., Archt., Vice-Pres. Nat. Fire Brigades' Union.

PROFESSOR ARCHIBALD BARR, D.Sc., M.Inst.C.E., Glasgow University.
SIR C. PURDON-CLARKE, C.I.E., F.S.A., late Victoria and Albert Museum.
SIR JOHN COCKBURN, K.C.M.G., M.D., late Premier of South Australia.
SIR W. MARTIN CONWAY, M.A., F.S.A.
MAJOR-GENERAL E. R. FESTING, C.B., F.R.S.
SIR DOUGLAS FOX, J.P., Past-President, Institution of Civil Engineers.
W. A. HART, M.V.O., Great Western Rly.
SPENCER HARTY, M.Inst.C.E., City Surveyor, Dublin.
W. T. HATCH, M.Inst.C.E., Chief Engineer, Metropolitan Asylums Board.
W. H. HUNTER, M.Inst.C.E., Chief Engineer, Manchester Ship Canal.
A. B. McDONALD, M.Inst.C.E., City Engineer, Glasgow.
C. E. NOVERRE, J.P., London Manager, Norwich Union Fire Office.
SIR W. HENRY PREECE, K.C.B., F.R.S., late Engineer-in-Chief General Post Office, Past-Pres. Inst. of Civil Engineers
GUY PYM, J.P., D.L., North British and Mercantile Insurance Company.
SIR BOVERTON REDWOOD, F.R.S.Ed., F.I.C., Adviser on Petroleum to the Home Office.
W. E. RILEY, F.R.I.B.A., The Architect, London County Council.
E. G. RIVERS, I.S.O., M.Inst.C.E., Chief Engineer H.M. Office of Works.
ALEXANDER SIEMENS, M.Inst.C.E., Past-Pres. Inst. Electrical Engineers.
SIR JAMES WEEKS SZLUMPER, M.Inst.C.E.
SIR HENRY TANNER, I.S.O., H.M. Office of Works.
SIR JOHN TAYLOR, K.C.B., Consulting Architect, H.M. Office of Works.
ROBERT VIGERS, Past President, The Surveyors' Institution.
ARTHUR WHITELEGGE, C.B., M.D., Chief Inspector of Factories, Home Office.
SIR JAMES WILLIAMSON, C.B., late Director of H.M. Dockyards.
SIR HENRY TRUEMAN WOOD, M.A. Secretary Society of Arts.

Executive:

MAX CLARKE, F.R.I.B.A. · CHARLES E. GOAD, M.Am.Soc.C.E., M.Can.Soc.C.E.;
PERCY COLLINS, J.P., F.S.S.,
J. HERBERT DYER, Sen. Vice-Pres. Nat. Fire Brigades' Union:
J. W. RESTLER, M.Inst.C.E., Dept.-Chief Eng. Metropolitan Water Board;
OSWALD C. WYLSON, F.R.I.B.A.

Gen. Hon. Secretary:

ELLIS MARSLAND, District Surveyor.

Hon. Auditors:

HORACE S. FOLKER, F.A.I., Vice-Pres. Nat. Fire Brigades' Union.
Surgeon-Major R. J. MAITLAND-COFFIN, F.R.C.P.

Bankers:

LONDON AND SOUTH WESTERN BANK,
Regent Street, S.W.

Testing Station:

NORTH BANK LODGE, HANOVER GATE, REGENTS PARK, N.W.

Offices:

1, WATERLOO PLACE, PALL MALL, LONDON, S.W
CHARLES ADAMI, *Assistant Secretary.*

Fig. 1. TEST NO. 4 (*View after Test*).

Fig. 2. TEST NO. 7 (*View during Test*).

NOTE.

The tests here recorded were undertaken with a view of arriving at data, which, if compared with those obtained in identical or similar tests in which hand chemical fire extinguishers are used, would allow of the relative value of the various types of first aid appliances being more properly realised than is generally the case.

The chemical fire extinguisher (containing 2 to 3 gallons of liquid), if so constructed that it can be readily and easily handled by parties not conversant with its action or peculiarities, has considerable advantages, assuming of course that it is in a proper, workable and clean condition.

But it should not be forgotten that the ordinary bucket of water and handpump have a very high fire extinguishing efficiency.

Thus, the advent of the hand chemical fire extinguisher should by no means imply neglect of the humbler and simpler extinguishing appliances.

EDWIN O. SACHS.

The Offices of the Committee,
1, Waterloo Place, Pall Mall,
London, S.W.,
December 16th, 1908.

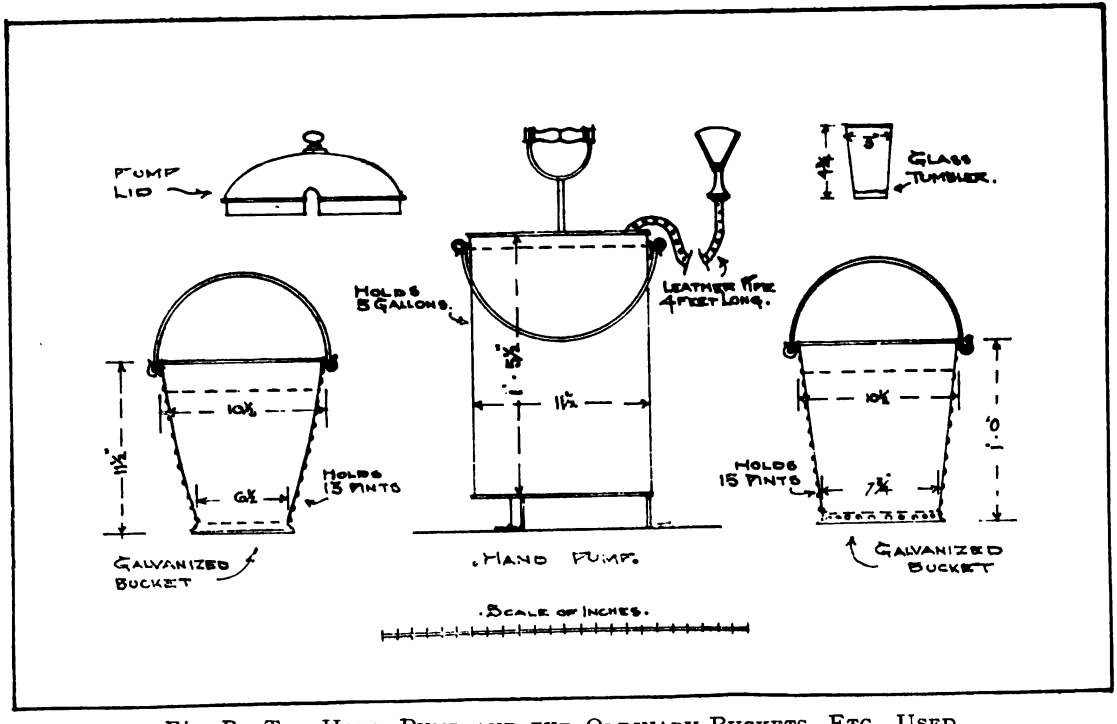

Fig. B. THE HAND PUMP AND THE ORDINARY BUCKETS, ETC., USED.

EXPERIMENTAL FIRE TESTS

CONDUCTED BY

THE EXECUTIVE

OF THE

British Fire Prevention Committee

[FOUNDED 1897—INCORPORATED 1899].

FIRE TEST No. B.B.—JULY 22ND, 1908.

BUCKETS OF WATER, HAND PUMPS, etc.,

AS IN COMMON USE.

OBJECTS OF TESTS.

To ascertain the effect of the application of water in small vessels, such as buckets, etc., upon various burning materials both in a room and in the open.

Note.—The tests were undertaken by the Committee. The tests were in certain instances followed by *re-tests*.

The following tests were applied:—

THE TESTS APPLIED.

The Committee's Tests.

TESTS NOS. 1 AND 1A.—These tests were undertaken to note the effect of the extinguisher upon a fire which was started at a dressing table in a bedroom with curtains, &c., above, the dressing table being draped with loose material and having inflammable articles lying thereon.

TEST NO. 2.—This test was undertaken to note the effect of the extinguisher upon burning hay in a raised wooden rack in a stable.

TEST NO. 3.—This test was undertaken to note the effect of the extinguisher upon a burning crate of loose wood-wool, such as might be found in a packing room of a wholesale or retail store.

TEST No. 4.—This test was undertaken to note the effect of the extinguisher upon a stack of twelve packing cases, stacked against a wall, open face outwards and each containing a small quantity of inflammable material such as would be used for packing.

TEST No. 5.—This test was undertaken to note the effect of the extinguisher upon a pyramidical stack of burning wood with wood-wool filled in.

TEST No. 6.—This test was undertaken to note the effect of the extinguisher upon a burning heap of straw and small pieces of soft wood damped with water.

TESTS Nos. 7 AND 7A.—These tests were undertaken to note the effect of the extinguisher upon burning celluloid.

TEST No. 8.—This test was undertaken to note the effect of the extinguisher upon burning logs, the fire being fed by laths and wood-wool.

TESTS Nos. 9 AND 9A.—These tests were undertaken to note the effect of the extinguisher upon burning petrol.

TEST No. 10.—*Not carried out.* This test is usually undertaken to note the effect of the extinguisher upon burning logs with laths, wood-wool and spirit.

TEST No. 11.—This test was arranged to note the effect of the extinguisher upon a bonfire composed of hay, straw, wood-wool and shavings when in an exposed position.

TEST No. 12.—This test was undertaken to note the effect of the extinguisher upon a series of burning heaps of oily rags and dirty cotton waste.

NOTE :—Tests Nos. 1A, 7A, and 9A were re-tests by order of the Committee.

SUMMARY OF THE TESTS.

The following is a summary of the results of the tests by the Committee :—

The tests demonstrated that a small quantity of plain water energetically applied from vessels in common use, such as buckets and simple hand-pumps, is almost uniformly effective in extinguishing promptly small fires in their early stages, except in respect to burning spirit, such as petrol.

The efficiency of plain water so applied does not depend upon exceptional skill or dexterity in handling the vessels or appliances, but, given fair aim, is mainly effected by the amount of energy accorded to the operation of throwing or pumping respectively.

The following table summarises the number of buckets, &c., used, the time occupied in their application, the distance at which they were operated, and the effect noted :—

Test or Re-test.	Number Buckets, etc.	Time occupied. min.	secs.	Distance of Operator. At first.	At end.	Remarks.
No. 1	2 tumblers, 1 jug, 1 pitcher, and 1 bucket of water, with a few splashes of second bucket.	0	50	12 ft.	(3·657 *m.*)	Fire out in 50 secs.
,, 1A	2 tumblers, 1 jug. 1 pitcher, and ½ bucket of water.	0	30	12 ft.	(3·657 *m.*)	Fire out in 30 secs.
,, 2	4 buckets, 1 hand pump, another bucket, then a bucket full in hand pump.	3	4	12 ft. (3·657 *m.*)	at close qtrs.	Fire checked, but smouldering continued.
,, 3	2 buckets and 2 splashes out of a third.	0	20	6 ft. (1·828 *m.*)	at close qtrs.	Fire out in 20 secs.
,, 4	8 buckets and 1 hand pump.	3	35	15 ft. (4·572 *m.*)	at close qtrs.	Fire out. in 3 mins. 35 secs.
,, 5	A little more than ½ hand pump.	2	1	at close	quarters	Fire out in 2 mins. 1 sec.
,, 6	1½ buckets.	0	22	at close	quarters	Fire out in 22 secs.
,, 7	3 buckets.	0	12	6 ft. (1·828 *m.*)	at close qtrs.	Fire out in 12 secs.
,, 7A	½ bucket of water from hand pump.	0	12	6 ft. (1·828 *m.*)	at close qtrs.	Fire out in 12 secs.
,, 8	1 bucket, ½ hand pump.	0	58	at close	quarters	Fire out in 58 secs.
,, 9	Half the contents of 1 hand pump with the addition of 1 bucket played continuously.	1	0	at close	quarters	Fire out, petrol all consumed.
,, 9A	The contents of 1 hand pump and 5 buckets played continuously.	4	5	at close	quarters	Fire out, petrol nearly all consumed.
,, 10		*not carried out*				
,, 11	3 buckets.	3	5	13 ft. (3·962 *m.*)	at close qtrs.	Fire nearly out in 45 secs.; fire out in 3 mins. 5 secs.
,, 12	4 buckets.	0	37	6 ft. (1·828 *m.*)	at close qtrs.	Fire out in 37 secs.

NOTE:—Each bucket contained about 14 pints of plain water on the average (buckets of 13 and 15 pints capacity were used). each pitcher 10 pints, each jug 1 quart, each tumbler ½ pint, hand pump 5 gallons.

NOTE:—No. 10 test omitted by order of the Committee.

CONDITIONS OF TEST.

The following rules were laid down by the Executive for extinguisher tests, were followed as far as practicable with the bucket tests, and served as a guide for the tests :—

The tests will generally be taken in numerical order, subject to alteration by the directing member.

Tests will, where considered advisable by the Sub-Committee, be repeated at their discretion (known as re-tests).

The extinguisher will be applied at the desire of the Sub-Committee either by a member of the Committee, or by a nominee.

The Committee provide material for certain tests as may be directed by the Sub-Committee and the testor for the others, but the Sub-Committee may replace the material provided by the testor by their own or use their own at re-tests.

The fire having been allowed to progress at the discretion of the directing member, the extinguisher will be applied from a position and at a distance pointed out by him, a time limit being set to each test at his discretion.

Directly the number of extinguishers specified have been used or the time limit has been reached, a whistle will be sounded and the test stopped, and any fire remaining will be extinguished otherwise than by extinguishers.

Directly a fire has been extinguished by an extinguisher, a whistle will be sounded and the test stopped.

The party extinguishing a fire must not touch the material under test, unless by direction of the directing member.

The contents of any extinguisher on the ground may be reserved for analysis, and any extinguisher, or extinguishers reserved for examination.

The arrangements are subject to alteration by the directing member.

The testor may put forward four "Demonstration" tests for the cognisance of the Sub-Committee, making his own arrangements and providing his own materials, but the Sub-Committee shall, if it considers advisable, order these tests to be repeated or repeated with variations to serve as Counter-Demonstrations.

DESCRIPTION OF BUCKETS, HAND PUMP, ETC.:—

Galvanised iron buckets, bought in the open market, were used. The two patterns used, with their dimensions, are shown in Fig. B. The buckets which contained 13 pints (7·383 *l.*) of water when filled to within 2 in. (·051 *m.*) of the rim, cost 2s. 3d., and the buckets which contained 15 pints (8·519 *l.*) when similarly filled, cost 2s. 8d.

The hand pump was of the ordinary type, fitted in a large bucket as shown in Fig. B., purchaseable in the open market, at from £2 10s. to £4, according to quality and finish, and contained 5 gals. (22·717 *l.*) when filled to within 2 ins. of the top. The hose was of leather, copper riveted, and the nozzle had a diameter of ¾ in. (4·762 *m. m.*).

The pitcher was an ordinary earthenware bedroom pitcher of 10 pints (5·679 *l.*) capacity when filled to within 2 ins. (·051 *m.*) of the rim; the jug was an ordinary earthenware kitchen quart jug (1·136 *l.*), and the glass an ordinary ½ pint (·284 *l.*) kitchen tumbler.

RANGE OF BUCKETS, HAND PUMP, ETC.:—

The range, when handled by an able bodied man, selected *ad hoc*, and using the appliances without previous trial, was as follows:

Hand pump 45 ft. (14·020 *m.*) at 10 secs.; 40 ft. (12·192 *m*) at 30 secs., and 40 ft. (12·192 *m*) at 60 secs., the appliance being exhausted in 1 min. 27 secs. (*one man, one application*).

The contents of the 13 pint Buckets thrown 28 ft. (8·534 *m.*) (*average of six throws by two men, three throws each*).

The contents of the 15 pint Buckets thrown 27 ft. 6 ins. (8·382 *m.*) (*average of six throws by two men, three throws each*).

DESCRIPTION OF TESTING PLANT.

The tests were conducted at the Committee's Testing Station at North Bank, Regent's Park.

Of the tests, Nos. 5, 9, 9A and 11, were undertaken in the open and tests Nos. 1, 1A, 2, 3, 4, 6, 7, 7A, 8, and 12 in the testing chambers of the Committee.

Testing Chambers, Nos. 1, 1A, 2 and 3 were used.

Test No. 2 was undertaken in Hut No. 1 ; tests Nos. 3, 7, 7A and 12 in Hut No. 1A ; tests Nos. 1, 1A, 6 ; and tests Nos. 4 and 8 in Hut No. 3. Of the tests in the open test No. 11 was taken on the top of Hut No. 1A.

Testing Chamber No. 1 was a covered hut measuring 10 ft. by 10 ft. by 8 ft. high (3·048 by 3·048 by 2·438 *m.*). Testing Chamber No. 1A was a covered hut with its front open and measured 10 ft. by 10 ft. by 8 ft. 11 in. (3·048 by 3·048 by 2·717 *m.*). Testing Chamber No. 2 was a covered hut measuring 22 ft. 3 in., by 10 ft. by 8 ft. 3 in. (6·781 by 3·048 by 2·514*m.*). Testing Chamber No. 3 was an open hut without roof, measuring 22 ft. 3 in. by 15 ft. floor surface (6·781 by 4·572 *m.*).

Note.—The materials for the tests were of the ordinary description and were provided by the Committee.

PREPARATION FOR AND CONDUCT OF THE TESTS.

The tests were undertaken on July 22nd, 1908.

The weather on July 22nd was overcast. The wind S.S.E. The Barometer at 3 p.m. at the Botanical Gardens registered 30·24 and the attached Thermometer 62·8 (16·9 *C.*). The dry bulb was 65·8 Fahr. (18·7 *C.*). Dull, close, day.

The tests were started at 4 p.m.

The Directing Member of the Sub-Committee decided *ad hoc* immediately before the commencement of each test or re-test, who should operate the appliances.

THE OBJECT OF CONDITIONS AND ARRANGEMENTS FOR THE TESTS, WITH THE LOG OF EACH TEST.

TESTS NOS. 1 AND 1A.

Object of Tests Nos. 1 and 1A.—These tests were undertaken to note the effect of buckets, &c., upon a fire which was started at a dressing table in a bedroom with curtains, &c., above, the dressing table being draped with loose material and having inflammable articles lying thereon.

Arrangements for Tests Nos. 1 and 1A.—Against the south wall of Hut No. 2 was placed a small deal table which had a covering and valance of figured muslin. On the table were celluloid combs, boxes, and a hand glass. On the right of the table was a cane-seated chair, and on the left a similar chair and a wicker basket containing waste paper. Above the table was a wooden cornice with valance and pole, over which were hung two pairs of lace curtains with two paper fly-catchers. The wall of the back of the table and the two side walls for some few feet on either side were papered.

Log of Test No. 1.—The waste paper in the basket was lighted and the fire was allowed to burn for 1 min. 45 secs.

The flames obtained a fair hold of the materials.

2 Tumblers, 1 jug, 1 pitcher and 1 bucket of water, with a few splashes out of a second bucket, were applied from a distance of 12 ft. (3·657 *m.*) away.

The fire was extinguished in 50 secs.

The paper basket and the paper were burnt. One window curtain and one fly-catcher was consumed and table cover slightly burnt.

Log of Test No. 1A.—The test was repeated with fresh materials. The fire was similarly lighted and allowed to progress for 1 min. 10 secs.

Two tumblers, one jug, one pitcher and half-a-bucket of water were applied as before.

The fire was extinguished in 30 secs.

TEST No. 2.

Object of Test No. 2.—This test was undertaken to note the effect of buckets, &c., upon hay in a raised wooden rack in a stable.

Arrangements for Test No. 2.—Opposite the door in west side of Hut No. 1 was placed a wooden erection to represent a hay rack in a stable. This rack was composed of light strips of wood, fixed 3 ft. 4 in. (1·016 *m.*) above the floor. It was 5 ft. 8 in. (1·727 *m.*) long, 2 ft. 4 in. (0·711 *m.*) deep, and 3 ft. (0·914 *m.*) from back to front. The back and one end were formed by the brickwork of the hut; the front, bottom, and one end, of wood strips. Half a truss of hay was placed loosely in the rack.

Log of Test No. 2.—The hay was lighted at one point and allowed to burn for 1 min.

The flames obtained a good hold of the hay.

Four buckets, one hand-pump (full), another bucket, and then a bucket full in the hand-pump were applied at first 12 ft. (3·657 *m.*) away, but afterwards inside the hut. In 3 min. 4 secs. the test was discontinued.

The flames were held in check, but smouldering continued.

The smouldering material eventually went out.

TEST No. 3.

Object of Test No. 3.—This test was undertaken to note the effect of buckets, &c., upon a burning crate of loose wood-wool, such as might be found in a packing room of a wholesale or retail store.

Arrangements for Test No. 3.—A lightly made crate, composed of strips of wood and measuring 4 ft. by 3 ft. 3 in. by 1 ft. 10 in. (1·219 *m.* by 0·991 *m.* by 0·558 *m.*) deep, was loosely filled with wood-wool. The crate was raised about 5 in. (·127 *m.*) from the floor of Hut No. 1a, being stood on four bricks.

Log of Test No. 3.—The fire was lighted in two places and allowed to burn for 50 secs.

The flames had obtained complete hold of the wood-wool, and had slightly charred the crate.

Two buckets and two splashes out of a third one were applied 6 ft. (1·828 *m.*) away, and afterwards at close quarters.

The fire was extinguished in 20 secs., a small quantity only of wood-wool remained.

TEST No. 4.

Object of Test No. 4.—These tests were undertaken to note the effect of buckets, &c., upon a stack of twelve packing cases stacked against a wall, open face outwards and each containing a small quantity of inflammable material such as would be used for packing. (*See Fig.* 1).

Arrangements for Test No. 4.—Twelve wooden cases, each measuring about 3 ft. (0·914 *m.*) square by 2 ft. deep (0·609 *m.*) were piled up against the north wall of Hut No. 3, facing south. Some small pieces of laths and a little wood-wool was strewn about inside the cases.

Log of Test No. 4.—The fire was lighted at two points and allowed to burn for 45 secs. The flames obtained a good hold of the inside of most of the cases.

Seven buckets, one hand-pump (full) and another bucket-full in the hand-pump were applied, first at 15 ft. (4·572 *m.*) away, and then at close quarters. The fire was extinguished in 3 mins. 35 secs. (*See Fig.* 1.)

The shavings and loose material were consumed and the interior much charred.

TEST No. 5.

Object of Test No. 5.—This test was undertaken to note the effect of buckets, &c., upon a pyramidical stack of wood with wood-wool filled in.

Arrangements for Test No. 5.—A pyramidical stack of wood was erected in the open, about 12 ft. (3·657 *m.*) high and about 6 ft. (1·828 *m.*) in diameter at base and filled in with some small pieces of wood, laths and wood-wool.

Log of Test No. 5.—The fire was lighted at two points and allowed to progress for 1 min.

A little more than half-a-hand-pump was used at close quarters all round the pyramid.

The fire was extinguished in 2 mins. 1 sec.

All wood-wool and loose material was consumed and the wood a good deal charred.

TEST No. 6.

Object of Test No. 6.—This test was undertaken to note the effect of buckets, &c., upon a burning heap of straw and small pieces of soft wood damped with water.

Arrangements for Test No. 6.—A bushel of small pieces of soft wood was mixed with half a truss of straw and loosely stacked on floor of Hut No. 1, forming a heap about 2 ft. high (0·609 *m.*)

and 4 ft. (1·219 *m.*) in diameter and one gallon (4·543 *l.*) of water sprinkled over same.

Log of Test No. 6.—The fire was lighted at one point and was allowed to progress for 2 mins.

The flames obtained a fairly good hold of the straw.

One bucket and a quarter were applied at close quarters, and the fire was extinguished in 22 secs.

A small part of the straw only was consumed.

TESTS Nos. 7 AND 7A.

Object of Tests Nos. 7 and 7A.—These tests were undertaken to note the effect of buckets, &c., upon burning celluloid. (*See Fig.* 2).

Arrangements for Test No. 7.—A circular heap of celluloid shavings, scraps and dust, measuring about 2 ft. diameter by about 1 ft. high (0·609 *m.* by 0·305 *m.*) in the centre, was placed on the floor of Hut No. 1a.

Log of Test No. 7.—The fire was lighted at one point.

The flames immediately obtained a good hold of the celluloid.

Three buckets were applied 6 ft. (1·828 *m.*) away, and afterwards at close quarters.

In 12 secs. the fire was put out.

A very small quantity of the celluloid was consumed, and the remainder was saturated with water. It was afterwards set alight, and allowed to burn itself out.

Log of Test No. 7A.—The unconsumed celluloid was then relighted and about a quarter bucket of water from the hand-pump put it out in 12 secs.

TEST No. 8.

Object of Test No. 8.—This test was undertaken to note the effect of buckets, &c., upon burning logs, the fire being fed by laths and wood-wool.

Arrangements for Test No. 8.—Twenty-four logs of deal about 5ft. (1·524 *m.*) in length, 4 in. by 3 in. (·102 by ·076 *m.*) were placed in a pile in Hut No. 3. Laths were placed between the logs. The interior was filled with laths and wood-wool loosely packed.

Log of Test No. 8.—The fire was lighted in two places and allowed to burn for 1 min. 40 secs.

One bucket and about one-fifth of the hand-pump were applied at close quarters.

The fire was extinguished in 58 secs.

All wood-wool and the laths were consumed. The logs were much charred on the surface.

TESTS Nos. 9 AND 9A.

Object of Test No. 9.—This test was undertaken to note the effect of buckets, &c., upon burning petrol vapour. (*See Fig.* 3).

Arrangements for Test No. 9.—Four floor boards were placed together and fastened underneath by cross-battens, the joints were caulked, and a skirting 9 in. by 1 in. (0·229 *m.* by 0·025 *m.*) was fastened around the outside of the boards. They measured 13 ft. long by 2 ft. 4in. wide (3·962 *m.* by 0·711 *m.*). The whole of the boards were first sprinkled with a pint (0·568*l.*) of petrol, and then one gallon (4·543 *l.*) was poured on.

Log of Test No. 9.—The fire was lighted at one point.

Fig. 3. TEST NO. 9A (*View during Test*).

Water was played on for 60 secs, from the hand pump, but the petrol burnt itself out in that time.

One bucket had been used to keep the hand pump filled, which was still half full at the conclusion of its application.

Arrangements for Re-Test 9A.—The arrangements were identical as for Test No. 9, but a screen was used at one end of the floor boards.

Log of Re-Test 9A.—The fire was lighted at one point. Water was played for 4 min. 5 secs. by two men, in turns, and the fire was extinguished and a little petrol was found remaining. Five buckets of water were used to keep hand pump filled, which was almost empty at the conclusion of its application.

TEST No. 11.

Object of Test No. 11.—This test was arranged to note the effect of buckets, &c., upon a bonfire composed of hay, straw, wood-wool and shavings when in an exposed position.

Arrangements for Test No. 11.— A bonfire composed of a quarter truss of hay, half a truss of straw, a quarter bale of wood-wool, and half a sack of shavings well mixed was loosely piled on the roof of Hut No. 1A. The heap measured 6 ft. by 3 ft. 6 in. high (1·828 *m.* by 1·067 *m.*).

Log of Test No. 11.—The fire was lighted at one point and allowed to burn for 1 min. A nominee of the Committee carried a bucket up the ladder on to the roof and commenced extinguishing operations at about 13 ft. (3·962 *m.*) distance. Two buckets were on the roof. He operated at close quarters with these.

The fire was nearly extinguished in 45 secs. by using almost the entire contents of 3 buckets.

The operator raked the material over after about 1 min., and the fire was finally extinguished by stamping out and by some water remaining in the buckets, after 3 mins. 5 secs.

TEST No. 12.

Object of Test No. 12.—This test was undertaken to note the effect of buckets, &c., upon a series of burning heaps of oily rags and dirty cotton waste

Arrangements for Test No. 12.—A series of six small heaps, each about 1 ft. by 1 ft. (0·306 by 0·306 *m.*) high, of oily rags and dirty cotton waste were arranged on the floor of Hut No. 1a, and these were connected by trains of similar material soaked in spirit.

Log of Test No. 12.—The fire was lighted in two places and allowed to progress for 1 min. 30 secs.

The flames obtained good hold of all the heaps.

The heaps were extinguished in 37 secs. by 4 buckets of water.

GENERAL ARRANGEMENTS.

The tests were carried out according to the procedure laid down by the Executive for investigations of this description, and were conducted by a Sub-Committee of the Executive comprising Messrs. :—

Percy Collins, J.P., F.S.S. (*Directing Member*)
Ellis Marsland (Dist. Surveyor), *Gen. Hon. Secretary.*
James Sheppard, A.Inst.E.E. (Surveyor, North British and Mercantile Insurance Co.). [Since deceased].
J. Herbert Dyer (Senior Vice-Pres. Nat. Fire Brigades' Union).
R. W. Henderson, J.P., (Chief Officer Rickmansworth Fire Brigade).

A. H. Lister assisted the Sub-Committee.

The Council was represented for the testing operations of 22nd July, 1908, by :—

Sir James Williamson, C.B. (late Director of H.M. Dockyards).

The Executive was represented for the testing operations of 22nd July, 1908, by :—

Edwin O. Sachs, F.R.S.Ed. (Chairman).

The general body of members was represented for the testing operations of 22nd July, 1908, by :—

Messrs. Bertram Chatterton, A.M.Inst.C.E. (Surveyor, Yorkshire Insurance Co.); Louis T. Healy, A.Inst.E.E. (Royal Insurance Co.); Jos. Randall, A.M.Inst.C.E.; Percy E. Ridley, A.Inst.E.E.

The following visitors attended at the Testing Station by special invitation of the Executive during the testing operations of 22nd July, 1908 :—

The Right Hon. the Earl of Londesborough; Messrs. Geo. T. Bullock (Union Fire Office); A. R. Dyer, A.M.Inst.C.E. (Assistant Divisional Officer, London Fire Brigade); Lt.-Col. Fox (Chief Officer, London Salvage Corps); W. H. Hunter (Hand-in-Hand Fire Insurance Co.); W. H. Ross (Messrs. A. L. Gibson and Co.); Wm. Thomson.

Signed.

For the Sub-Committee conducting the test :—
PERCY COLLINS.

For the General Testing Arrangements Sub-Committee :—
J. HERBERT DYER.

For the Executive :—
EDWIN O. SACHS.

Published by the Committee as directed by the Executive.

C. ADAMI,
(*Asst. Sec.*)
Date.—16*th December*, 1908.

Verified a true copy of the Report as ordered to be published.

ROSE-INNES, SON and CRICK (*Solicitors*).
Date.—30*th December*, 1908.

Lists of the Committee's Publications, Contents of the Committee's Journal, etc., are obtainable upon application to the Assistant Secretary, 1, Waterloo Place, Pall Mall, London, S.W.

"RED BOOKS" OF THE

BRITISH FIRE PREVENTION COMMITTEE.—No. 129.

Edited by the Executive.

463127

FIRE TESTS

WITH

TEXTILES.

TEXTILE FABRICS UNTREATED

AND

TEXTILE FABRICS TREATED WITH A FIRE-RESISTING MATERIAL KNOWN AS "FLAMEOFF."

SUBMITTED FOR TEST BY

THE 'FLAMEOFF" CO.

LONDON.

The Committee's Report.

ALL RIGHTS RESERVED.

LONDON, 1908.

PUBLISHED AT THE OFFICES OF
THE BRITISH FIRE PREVENTION COMMITTEE
(Founded 1897—Incorporated 1899).
1, WATERLOO PLACE, PALL MALL.

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OBJECTS OF THE COMMITTEE.

The main objects of the Committee are:—

To direct attention to the urgent need for increased protection of life and property from fire by the adoption of preventive measures.

To use its influence in every direction towards minimising the possibilities and dangers of fire.

To bring together those scientifically interested in the subject of Fire Prevention.

To arrange periodical meetings for the discussion of practical questions bearing on the same.

To establish a reading-room, library and collections for purposes of research, and for supplying recent and authentic information on the subject of Fire Prevention.

To publish from time to time papers specially prepared for the Committee, together with records, extracts, and translations.

To undertake such independent investigations and tests of materials, methods, and appliances as may be considered advisable.

The Committee's Reports on Tests with Materials, Methods of Construction, or Appliances are intended solely to state bare facts and occurrences, with tables, diagrams, or illustrations, and they are on no account to be read as expressions of opinion, criticisms, or comparisons.

The Committee is not responsible for the views of individual authors as expressed in Papers or Notes, but only for such observations as are formally issued on behalf of the Executive.

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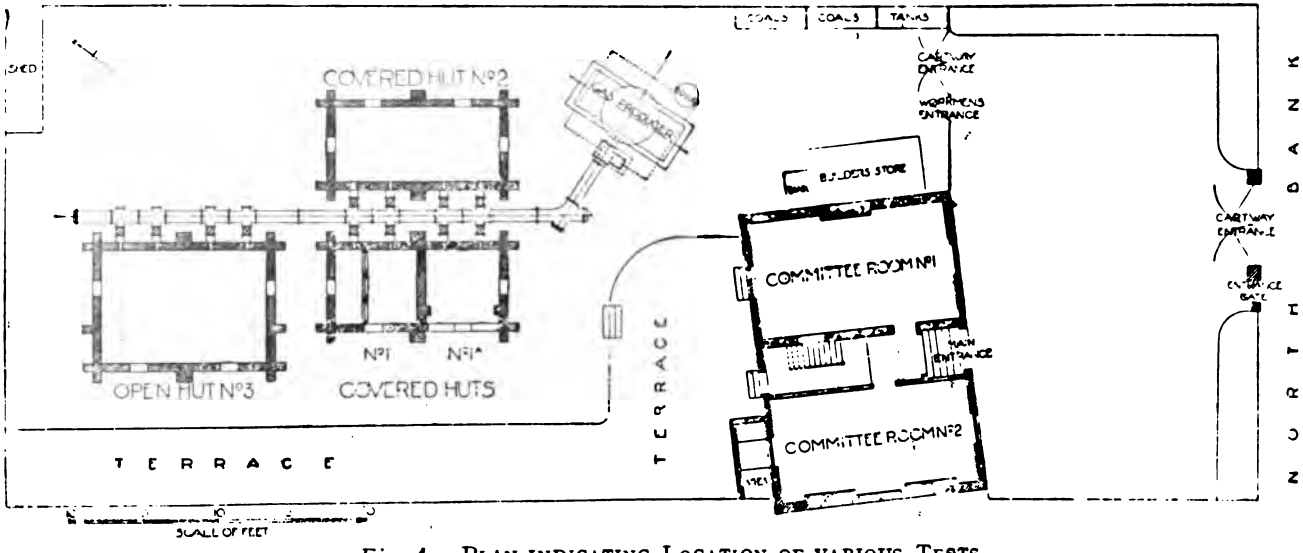

Fig. A. PLAN INDICATING LOCATION OF VARIOUS TESTS

NOTE.

A large number of lives are lost annually owing to the rapidity with which light textiles catch and spread flame.

An extraordinary number of people also meet with personal injury, either of permanent or temporary character owing to the same cause, and children in particular are sufferers, especially the children of the poorer classes.

Any effort made to reduce the rapidity of spread of fire in light textiles must claim careful consideration, and equally so, whether the means proposed of lessening the risk of fire comprises the use of proprietary articles or the use of chemicals available to all.

Chemicals have long been known to be useful in obtaining non-flammability, but they generally present difficulties as to their use, as in course of time their virtue diminishes and unless the treatment is renewed there is a sense of false security.

Some simple chemicals, combined in a form which can be easily and frequently used, are the subject of this report.

The chemicals are combined in such a manner that after the ordinary process of washing has taken place, they will either produce non-flammability only, or where the goods require starching the same chemicals will produce simultaneously stiffness as well as non-flammability. *See Appendix*).

As to the tests the report speaks for itself, and an appendix has been added, indicating how the treatment should be applied. It is to be hoped that the tests undertaken by the committee may do something towards reminding managers of public institutions, laundry managers, and even the ordinary householder that there are means available for reducing the fire hazard in washable textiles.

It should be noted that the time taken for treating the various materials with "Flameoff" was two hours by the Croydon Laundry and eight hours by the Whitley Laundry, but the extra time taken for the treatment by the latter Laundry did not produce any better results than the former, and in the test with the chintz were hardly so satisfactory.

ELLIS MARSLAND.

1, Waterloo Place,
Pall Mall, London, S W.
18th November, 1908.

FIG. B.—TREATED TEXTILE UNDER TEST.
(*Before Test*).

FIG. C.—TREATED TEXTILE UNDER TEST.
(*After Test*).

OFFICIAL REPORTS

OF THE

British Fire Prevention Committee

[FOUNDED 1897—INCORPORATED 1899].

FIRE TEST No. 95.—JULY 1ST AND 22ND, 1908.

TEXTILE FABRICS UNTREATED

AND

TEXTILE FABRICS TREATED WITH A FIRE-RESISTING MATERIAL KNOWN AS "FLAMEOFF."

SUBMITTED FOR TEST BY

THE "FLAMEOFF" CO.

LONDON.

OBJECT OF TEST

To ascertain the effect of the application of "Flameoff" to the following textile fabrics, viz. :—

Flannelette, Chintz, Chiffon, Calico, Swiss Lace Curtains and Madras Curtains. and to compare the materials so treated with similar materials untreated.

Note.—The tests to be undertaken were the following :—

I. To note the effect of a jet of flame on textiles, untreated, as received from the manufacturers.

II. To note the effect of a jet of flame on textiles, untreated, after being washed in an ordinary manner.

III. To note the effect of a jet of flame on textiles, treated with Flameoff after being washed.

Note.—The flannelette, calico and chintz were known to have been made in Lancashire, the chiffon in France, and the Madras muslin curtains in Ayrshire. The origin of the other materials could not be traced.

Note.—Of the eight textiles under test eight portions (about three yards each) were to be dealt with as follows :—Two portions were to be tested as delivered from manufacturers, two were to be washed by two different laundries, one north of England, one south of England ; and of the four remaining portions two each were to be washed and treated respectively by the same two laundries.

Note.—The jet of flame was to be applied by spirit lamp, gas burner, or any other means, as directed by the Committee.

SUMMARY.

The materials as delivered from the manufacturers burnt rapidly in all tests.

The materials as washed in the ordinary way burnt rapidly in all tests.

The materials as washed and treated with "Flameoff" charred only in 69 tests, and burnt slightly in 3 tests, out of a total of 72 tests conducted with 57 portions of material.

The following table summarises the tests undertaken :—

TABULATED SUMMARY OF RESULTS OF TESTS.

	Conditions of Test.	Group A. Flannelette.	Group B. Chintz.	Group C. Chiffon.	Group D. Calico.	Group E. Coarse Calico.	Group F. Swiss Lace Curtains.	Group G. Lace Curtains.	Group H. Madras Muslin Curtains.
	To note the effect of a jet of flame upon samples of textile materials as received from the manufacturer.	*On the application of flame the material burnt freely, and was all consumed within two minutes.*	*On the application of flame the material burned fiercely, and within two minutes the whole was consumed.*	*On the application of flame the material started to burn, and within one minute was all consumed.*	*On the application of flame the material immediately started to flame, and was wholly consumed in 2min 34sec.*	*On the application of flame the material immediately started to flame, and within 2 minutes was all consumed.*	*On the application of flame the material immediately commenced to flame, and in one minute was all consumed.*	*On the application of flame the material commenced to flame fiercely, and was all consumed in 1min. 40sec.*	*On the application of flame the material commenced to flame fiercely, and was all consumed within one minute.*
	To note the effect of a jet of flame upon samples of textile materials after being washed, dried, and ironed in the ordinary manner at a laundry.	*On the application of flame the material burnt freely, and was all consumed within two minutes.*	*On the application of flame the material started to burn, and within two minutes the whole was consumed.*	*On the application of flame the material commenced to burn, and of the two samples tested, ⅔rds of one and 1-10th of the other remained when the flame expired.*	*On the application of flame the material at once started to burn, and continued to burn until the conclusion of the test.*	*On the application of flame the material at once started to burn, and burnt very quickly, and was all consumed in 1min. 25sec.*	*On the application of flame the material at once started to burn very freely, and was all consumed within two minutes.*	*On the application of flame the material commenced to burn very quickly, and was all consumed within one minute.*	*On the application of flame the material commenced to burn very quickly, and was all consumed in 65sec.*
III.	To note the effect of a jet of flame upon samples of textile materials after being washed and then treated with "*Flameoff.*"	On the application of flame the material charred only where in contact with the flame, or as far as the power of the flame reached, the material did not carry flame.	On the application of flame the material charred only where in contact with the flame, except in two cases when the charring was followed by slight flame, See 6a and 6b. and in one other, 8a about half the material was consumed.	On the application of flame the material charred only where in contact with or as far as the power of the flame reached, the material did not carry flame.	On the application of flame the material charred only where in contact with the flame, or as far as the power of the flame reached; the material did not carry flame.	On the application of flame the material charred only where in contact with the flame, or as far as the power of the flame reached the material did not carry flame.	On the application of flame the material charred only where in contact with the flame, or as far as the power of the flame reached; the material did not carry flame.	On the application of flame the material charred only where in contact with the flame, or as far as the power of the flame reached the material did not carry flame.	On the application of flame the material charred only where in contact with the flame, or as far as the power of the flame reached the material did not carry flame.

ARRANGEMENTS FOR THE TESTS.

The samples of the various materials as received from the manufacturer were each divided into eight portions; each portion was about three yards (2·7431*m.*) in length.

Two portions of each sample were retained as received from the manufacturer.

One portion of each sample was sent to The Provincial Laundries, Ltd., Whitley Bay, Northumberland (***known as the Whitley Laundry in this report***), and was washed as follows in a rotary washing machine :—

Cold water breakdown	10	minutes.
Washed in warm water with Gossage's best pale soap and crystal soda	25	,,
Rinsed in lukewarm water	5	,,
Rinsed in cold water	5	,,
Hydro extractor	10	,,
Dried and ironed by hand.		

One portion of each sample was sent to the Croydon American Steam Laundry, Gloucester Road, Croydon, near London (***known as the Croydon Laundry in this report***), and was washed as follows :—

Soaked in soft water, then washed in warm water with best curd mottled soap, rinsed, dried and ironed.

Two portions of each sample were sent to the Whitley laundry, and were washed as follows in a rotary machine and then treated with " Flameoff " :—

Cold water breakdown	10	minutes.
Washed in warm water with Gossage's best pale soap and crystal soda	25	,,
Rinsed in lukewarm water	5	,,
Rinsed in cold water	5	,,
Hydro extractor	10	,,

Dried and treated with " Flameoff " as follows :—

One and a-half pounds (·68 *kilos*) of Flameoff to 1 gal. (4·54 *li.*) of boiling water ; the articles were left in the liquid for eight hours, taken out and dried at a temperature of 60° Fahr. (15·5 C.).

Two portions of each sample were sent to the Croydon Laundry and were washed as follows, and then treated with " Flameoff " :—

Soaked in soft water, washed in warm water with best curd mottled soap ; rinsed and dried. Then steeped in a preparation of " Flameoff," made up of 12 ozs. (·34 *kilos*) to the half gallon (2·27 *li.*) of hot (not boiling) water for two hours, wrung out, dried and ironed.

Note.—The samples of chintz, Swiss lace curtains, lace curtains, and Madras curtains in the untreated samples were, in addition, starched.

Note.—An abbreviated description only of the form of washing or treatment is given in the Log of the Tests.

The number of days from treatment to the day of test, July 1st, was (approximately) 61 and to July 22nd (approximately) 82 days.

The length of the test pieces cut from each portion of three yards was one yard (0·91*m.*).

The tests were conducted in a closed hut, No. 2, also in an open hut, No. 1, and in the committee room of the testing station.

The material in the majority of the tests was suspended from a beam near the ceiling of huts Nos. 1 and 2 respectively (see Figs B and C).

The means of producing flame was in the majority of cases by a spirit lamp, giving a flame of about 3 ins. (·076*m.*).

A gas ring 3½in. diameter was also used in some of the tests and a blow pipe in others (see Log).

The tests with the spirit lamp were conducted as follows :— At a given signal the lamp was placed either in direct contact with the lower end of the suspended material or immediately beneath it and remained there during the test, except when the burning material fell, then it was removed.

The duration of the tests varied from one minute to three minutes, so that a sample treated from each laundry had as far as practicable alternate periods (see Log).

PREPARATIONS FOR TEST.

The tests were undertaken on July 1st and July 22nd, 1908.

The weather conditions on July 1st were as follows at 3 p.m. :— State of weather, clouds ; wind, E.S.E. ; barometer, 30·26 ; attached thermometer, 73° Fahr. (22·7C.) ; dry bulb, Fahr. 80·2° (26·7C.) ; wet bulb, Fahr. 63° (17·2C.). Bright sunny afternoon.

And at 3 p.m. on the 22nd :—

State of weather, overcast ; wind, S.S.E. ; barometer, 30·24 inches ; attached thermometer, Fahr. 62·8° (16·9C.) ; dry bulb, Fahr. 65·8° (18·7C.) ; wet bulb, Fahr. 61·8° (16·5C.). Dull, close day.

For the tests on July 1st, a small table was placed in Hut No. 2 and from a beam near the ceiling the materials were suspended in succession by means of a pin from one corner and brought down over the spirit lamp, which was placed in position and removed as required.

For the tests conducted with the blow pipe, the material was placed in a heap on the floor of the hut, and the flame played upon it.

For the tests conducted with the gas ring, which took place in the Committee Room, the gas ring was placed on a chair and the material was held in a heap against it.

For the tests on July 22nd a small table was placed in Hut No. 1, and from a beam near the ceiling the materials were suspended in succession by means of a pin from one corner and brought down over the spirit lamp, which was placed in position and removed as required.

The following tables give the Logs of the several Tests :—

LOG OF TESTS.

GROUP A.—FLANNELETTE.

No. on Sample.	If treated, by whom.	Conditions of Treatment.	Where Tested.	How placed for Testing.	Means of producing Flame.	Distance of Burner from Fabric.	Duration of Test.	Log.
1. A.	*Non-treated.*	*Direct from Manufactory.*	*Hut No. 2.*	*Suspended over flame.*	*Spirit lamp.*	2½ *ins.*	*Till consumed.*	*Burned rapidly when started after 4 sec. Dropped from beam in 45 sec. and all consumed in 59 sec.*
3. A.	*Non-treated, Croydon Laundry.*	*Soaked and washed in warm water, rinsed, dried, and ironed.*	*Ditto.*	*Ditto.*	*Ditto.*	2½ *ins.*	*Till consumed.*	*Burned immediately fiercely, with much smoke. Dropped from beam in 41 sec, and was all consumed.*
*4. A.	*Non-treated. Whitley Laundry.*	*Washed, rinsed, dried, and ironed.*	*Hut No. 1.*	*Ditto.*	*Ditto.*	*Direct contact.*	*Till consumed.*	*The material caught at once and burnt fiercely. It fell in 17 sec., and burnt itself out in 1 min. 58 sec.*
5. A.	Croydon Laundry.	Soaked and washed in warm water, rinsed and dried. Treated with "Flameoff" for 2 hrs., wrung out, dried and ironed.	Hut No. 2.	Ditto.	Ditto.	2½ ins.	3 min.	Began to char after 2 sec. where in contact with flame. At end of test it was charred upwards from the lower end 4 ins.
51 A.	Ditto.	Do.	Committee Room.	Held against flame.	Gas ring.	Direct contact.	1 min.	The fabric was only charred where touched by the flame and died out when removed.
*5b. A.	Ditto.	Do.	Hut No. 1.	Suspended over flame.	Spirit lamp.	Direct contact.	1 min.	Charred quickly as far as the power of the flame reached. The charred portion was very friable and extended upwards from the bottom 6 ins. The material did not carry flame.
7. A.	Ditto.	Do.	Hut No. 2.	Ditto.	Ditto.	2½ ins.	3 mins.	In 1 min. it began to char where in contact with the flame, and at the end of the test it was charred upwards from the lower end 4 ins.
*7a. A.	Ditto.	Do.	Hut No. 1.	Ditto.	Ditto.	Direct contact.	3 mins.	Charred upwards for about 6 ins. as far as the power of the flame reached. The extra time had no additional effect on the material. The material did not carry flame.

*Tested July 22nd, 1908.

GROUP B.—CHINTZ.

No. on Sample.	If treated, by whom.	Conditions of Treatment.	Where Tested.	How placed for Testing.	Means of producing Flame.	Distance of Burner from Fabric.	Duration of Test.	Log.
1. *B.*	*Non-treated*	*Direct from Manufactory.*	*Hut No. 2.*	*Suspended over flame.*	*Spirit lamp.*	2½ ins.	*Till consumed.*	*Burned fiercely when started after 3 sec., and fell from beam in 20 sec., the whole consumed in 1 min.*
3. *B.*	*Non-treated Croydon Laundry.*	*Soaked and washed in warm water, rinsed, dried, starched and ironed.*	*Ditto.*	*Ditto.*	*Ditto.*	2½ ins.	*Till consumed.*	*Burnt, when started after 2 sec., for 12 sec., and then went out. Was relighted and burnt for 32 sec., and then fell and was all consumed in 1 min. 17½ sec.*
*4. *B.*	*Non-treated, Whitley Laundry.*	*Washed, rinsed, dried and ironed.*	*Hut No. 1.*	*Ditto.*	*Ditto.*	*Direct contact.*	*Till consumed.*	*Started to burn immediately, and in 14 sec was all alight. At 35 sec it fell, and in 46 sec. it was all consumed.*
5 B.	Croydon Laundry.	Soaked, washed in warm water, rinsed and dried; steeped in preparation of "Flameoff" for two hours, wrung out, dried, and ironed.	Hut No. 2.	Ditto.	Ditto.	2½ ins.	3 min.	Was not affected by the flame for 2 min. 12 sec., after which time it became charred at the lower end where exposed to the flame for 3 ins. up.
5a. B.	Ditto.	Do.	Committee Room.	Held against flame.	Gas ring.	Direct contact.	1 min.	Was only charred where touched by the flame and died out when removed.
*5b. B.	Ditto.	Do.	Hut No. 1.	Suspended over flame.	Spirit lamp.	Direct contact.	3 min.	Was charred upwards from the bottom only as far as the flame reached, and at the conclusion of the test the area charred was 5½ins. × 4ins. The material did not carry flame.
6. B.	Whitley Laundry.	Washed, rinsed and dried. Then steeped in a preparation of "Flameoff" for 8 hours. Taken out, wrung and dried, slightly damped down, and ironed by hand.	Hut No. 2.	Ditto.	Ditto.	2½ ins.	1 min.	Was only charred where touched by the flame for a distance from the lower end upwards for about 5 ins.
6a. B.	Ditto.	Do.	Ditto.	Held against flame.	Blow-pipe.	Direct contact.	2 min.	Broke into flame where exposed to the blow-pipe, and upon the continued action of the flame was partially consumed, and communicated the flames to the portions not so exposed.
*6b. B.	Ditto.	Do.	Hut No. 1.	Suspended over flame.	Spirit lamp.	Direct contact.	1 min.	Charred quickly and started to burn after 10 sec., and in 30 sec. the flame had travelled in a narrow width up the centre to the top, and then went out. About quarter of the material was consumed.
7. B.	Croydon Laundry.	Treated as Sample 5. B.	Hut No. 2.	Ditto.	Ditto.	2½ ins.	3 min.	This sample was more directly over the flame than any previous one, and commenced to char after 15 sec. At the conclusion of the test the lower end was charred and burnt away for an area of 3 ins. × 2 ins.
8. B.	Whitley Laundry.	Do. 6. B	Ditto.	Ditto.	Ditto.	2½ ins.	2 min.	Burnt slowly for 2 min. then the flame expired. About half of the sample was consumed.

*Tested July 22nd, 1908.

GROUP C.—CHIFFON.

No. on Sample.	If treated, by whom.	Conditions of Treatment.	Where Tested.	How placed for Testing.	Means of producing Flame.	Distance of Burner from Fabric.	Duration of Test.	Log.
1. C.	*Non-treated.*	*Direct from Manufactory.*	*Hut No. 2*	*Suspended over flame*	*Spirit lamp.*	2¼ *ins*	*Till consumed.*	*Started to burn freely at once It fell from the beam in 12 sec., and in 21 sec. it was all consumed except a small piece 6 ins. square.*
3. C.	*Non-treated, washed by Croydon Laundry.*	*Soaked, washed in warm water, rinsed, dried and ironed.*	*Ditto.*	*Ditto.*	*Ditto.*	2¼ *ins.*	3 *mins.*	*Did not light up for some seconds, and then after burning 1 min. 6 sec. the flame went out, leaving about two-thirds of the material unconsumed.*
*4. C.	*Non-treated, washed by Whitley Laundry.*	*Washed, wrung out, dried and ironed.*	*Hut No 1.*	*Ditto.*	*Ditto.*	*Direct contact*	3 *mins.*	*Lighted up immediately, and in 15 sec. the flame had travelled up to the top. In 30 sec. it fell and the flame expired, leaving about one-tenth of the material unconsumed.*
5. C.	Croydon Laundry.	Soaked, washed in warm water, rinsed and dried, then steeped for 2 hours in a preparation of "Flameoff," wrung out, dried and ironed.	Hut No. 2	Ditto.	Ditto.	2¼ ins.	3 min.	After 16 sec the material began to char, and at the conclusion of the test it was found to be only charred at the corner 4 ins. × 3 ins.
5a. C.	Ditto.	Do.	Committee Room.	Held against flame.	Gas ring.	Direct contact.	1 min.	Was only charred where touched by the flame.
*5b. C.	Ditto.	Do.	Hut No. 1	Suspended over flame	Spirit lamp.	Direct contact.	1 min.	The material charred up from the bottom and the flame ran partly up one side. At the conclusion of the test it was found that the extent of the charring was 18 ins.
*6. C.	Whitley Laundry.	Washed, wrung out and dried, then steeped in a preparation of "Flameoff" for 8 hours, wrung out, dried, slightly damped down and ironed by hand.	Ditto,	Ditto.	Ditto.	Ditto.	3 min.	The material was charred where affected by the flame, and at the conclusion of the test the charring reached for a distance of 11 ins. up from the bottom for a width of about 6 ins. The extra time of test had no additional effect. The material did not carry flame.
7. C.	Croydon Laundry.	Treated as Sample 5. C.	Hut No. 2.	Ditto.	Ditto.	2¼ ins.	3 min.	Flared up a little at first, and after 1 sec. was charred up from the end 3 ins. At the conclusion of test it was charred up 4 ins.
8. C.	Whitley Laundry.	Treated as Sample 6. C.	Ditto.	Ditto.	Ditto.	2¼ ins.	1 min.	At the conclusion of the test the material was found to be charred up from the end 5¼ ins.
8a. C.	Ditto.	Do.	Ditto.	Held agains flame.	Blow pipe.	Direct contact.	1 min.	Was only charred where touched by the flame.

*Tested July 22nd, 1908.

GROUP D.—CALICO.

No. on Sample.	If treated, by whom.	Conditions of Treatment.	Where Tested.	How placed for Testing.	Means of producing Flame.	Distance of Burner from Fabric.	Duration of Test.	Log.
1. D.	*Non-treated.*	*Direct from Manufactory.*	*Hut No. 2.*	*Suspended over flame.*	*Spirit lamp.*	2½ ins.	*Till consumed.*	*The material started to flame immediately, it dropped from the beam in 10 sec., and was turned over on the table till all consumed in 2 min. 34 sec.*
3. D.	*Non-treated, washed by Croydon Laundry.*	*Soaked, washed in warm water, rinsed, dried, and ironed.*	*Ditto.*	*Ditto.*	*Ditto.*	2½ ins.	3 mins.	*The material started to burn at once very fiercely, dropped from beam in 25 sec., and continued to burn on table till put out at expiration of test*
*4. D.	*Non-treated, washed by Whitley Laundry.*	*Washed, rinsed, starched, dried, and ironed by hand.*	*Ditto.*	*Ditto.*	*Ditto.*	*Direct contact.*	*Till consumed.*	*The material commenced to burn immediately, and in 15 sec the flame reached the top; in 30 sec. it was entirely involved, and was all consumed in 54 sec.*
5. D.	Washed and treated by Croydon Laundry.	Soaked; washed in warm water, rinsed and dried. Then steeped for 2 hours in a preparation of "Flameoff," wrung out, dried, and ironed.	Hut No. 2.	Ditto.	Ditto.	2½ ins.	3 min.	The material began to char after 17 sec., and at the conclusion of the test it was charred up from the end 5 ins.
5a. D.	Ditto.	Do.	Committee Room.	Held against flame.	Gas ring.	Direct contact.	1 min.	The material was only charred where touched by the flame.
*5b. D.	Ditto.	Do.	Hut No. 1.	Suspended over flame.	Spirit lamp.	Direct contact.	3 min.	The material charred only as far as the power of the flame reached, and at the conclusion of the test was charred upwards from the bottom 7½ ins. × 2½ ins. The material did not carry flame.
*6. D.	Whitley Laundry.	Washed, rinsed and dried. Then steeped for 8 hours in a preparation of "Flameoff," wrung out, dried, slightly damped, and ironed by hand.	Ditto.	Ditto.	Ditto.	Ditto.	1 min.	The material charred only as far as the power of the flame reached, but just at the end of the test there were signs of the charring increasing, and at the conclusion of the test the material was charred upwards from the bottom 8½ ins. × 3½ ins. The material did not carry flame.
7. D.	Croydon Laundry.	Treated as Sample 5. D.	Hut No. 2.	Ditto.	Ditto.	2½ ins.	3 min.	The material began to char after 5 sec., and at the conclusion of the test it was charred up from the end 4½ ins.
8. D.	Whitley Laundry.	Treated as Sample 6. D.	Ditto	Ditto.	Ditto.	2½ ins.	1 min.	At the conclusion of the test the material was charred upwards from the end 4 ins.
8a. D.	Ditto.	Do.	Ditto.	Held against flame.	Blow-pipe.	Direct contact.	1 min.	The sample was only charred where touched by the flame.

**Tested July 22nd, 1908.*

GROUP E.—COARSE CALICO.

No. on Sample.	If treated, by whom.	Conditions of Treatment.	Where Tested.	How placed for Testing.	Means of producing Flame.	Distance of Burner from Fabric.	Duration of Test.	Log.
1. *E.*	*Non-treated.*	*Direct from Manufactory.*	*Hut No. 2.*	*Suspended over flame.*	*Spirit lamp.*	2½ *ins.*	*Till consumed.*	*The material commenced to burn immediately on the application of the flame. About half of it fell down in 14 sec., and the other half in 22 sec. It was all consumed in 1 min. 40 sec.*
3. *E.*	*Non-treated, washed by Croydon Laundry.*	*Soaked, washed in warm water, rinsed, dried and ironed.*	*Ditto.*	*Ditto.*	*Ditto.*	2½ *ins.*	*Till consumed.*	*The material lighted up at once, and burned very quickly. It fell down in 16 sec., and was all consumed in 1 min. 25 sec.*
5. E.	Croydon Laundry.	Soaked, washed in warm water, rinsed and dried. Then steeped in a preparation of "Flameoff" for two hours, wrung out, dried and ironed.	Ditto.	Ditto.	Ditto.	2½ ins.	3 mins.	The material started to char at the lower end at once, and at the end of the test was charred upwards for 4½ ins.
5a. E.	Ditto.	Do.	Committee Room.	Held against flame.	Gas ring.	Direct contact.	1 min.	The sample was only charred where touched by the flame.
7. E.	Ditto.	Do.	Hut No. 2.	Suspended over flame.	Spirit lamp.	2½ ins.	3 min.	The material at the end of the test was charred for a distance up from the end of 4 ins.
8. E.	Whitley Laundry.	Washed, rinsed and dried. Then steeped in a preparation of "Flameoff" for eight hours, wrung out, dried, slightly damped down, and ironed by hand.	Ditto.	Ditto.	Ditto.	2½ ins.	1 min.	At the conclusion of the test the material was found to be charred for a distance of 3½ ins. up from the end.
8a. E.	Ditto.	Do.	Ditto.	Held against flame.	Blow-pipe.	Direct contact.	1 min.	The sample was only charred where touched by the flame.

GROUP F.—SWISS LACE CURTAINS.

No. on Sample.	If treated, by whom.	Conditions of Treatment.	Where Tested.	How placed for Testing.	Means of producing Flame.	Distance of Burner from Fabric.	Duration of Test.	Log.
1. F.	*Non-treated.*	*Direct from Manufactory.*	*Hut No. 2.*	*Suspended over flame.*	*Spirit lamp.*	*2½ ins.*	*Till consumed.*	*The material commenced to light up at once; half of it dropped in 8 sec., and was all consumed in 60 sec.*
3. F.	*Non-treated, washed by Croydon Laundry.*	*Soaked, washed in warm water, rinsed, dried, starched and ironed.*	*Ditto.*	*Ditto.*	*Ditto.*	*2½ ins.*	*Till consumed.*	*The material did not commence to flame so readily as 1. F, but burnt very fiercely when started, fell down in 30 sec., and was all consumed in 1 min. 27 sec.*
*4. F.	*Non-treated, washed by Whitley Lnd.*	*Washed, rinsed, dried and ironed.*	*Hut No. 1.*	*Ditto.*	*Ditto.*	*Direct contact.*	*Till consumed.*	*The material burnt freely, and the flame reached the top in 8 sec. In 15 sec. it fell, and was all consumed in 56 sec.*
5. F.	Croydon Laundry.	Soaked, washed in warm water, rinsed and dried. Then steeped for 2 hours in a preparation of "Flameoff," wrung out, dried, and ironed.	Hut No. 2.	Ditto.	Ditto.	2½ ins.	1 min.	At the conclusion of the test the material was charred upwards for a distance of 3½ ins. from the lower end.
5a. F.	Ditto.	Do.	Committee Room.	Held against flame.	Gas ring.	Direct contact.	1 min.	The material was only charred where touched by the flame.
*5b. F.	Ditto.	Do.	Hut No. 1.	Suspended over flame.	Spirit lamp.	Direct contact.	1 min.	The material charred only as far as the power of the flame reached, and at the conclusion of the test was charred upwards from the bottom for 10 ins. × 2 ins. The material did not carry flame.
*6. F.	Whitley Laundry.	Washed, rinsed, and dried. Then steeped in a preparation of "Flameoff" for 8 hours, taken out, dried, and finished in curtain frames.	Ditto.	Ditto.	Ditto.	Ditto.	3 min.	The material charred only as far as the power of the flame reached, the extra time causing a little additional charring. At the conclusion of the test the material was charred upwards from the bottom for 12 ins. × 3½ ins. The material did not carry flame.
7. F.	Croydon Laundry.	Treated as Sample 5. F.	Hut No. 2.	Ditto.	Ditto.	2½ ins.	1 min.	At the conclusion of the test the material was charred upwards for a distance of 3½ ins., but the fine network was not destroyed.
8. F.	Whitley Laundry.	Treated as Sample 6. F.	Ditto.	Held against flame.	Blow-pipe.	Direct contact.	1 min.	The sample was only charred where touched by the flame.

*Tested July 22nd, 1908.

GROUP G.—LACE CURTAINS.

No. on Sample.	If treated, by whom.	Conditions of Treatment.	Where Tested.	How placed for Testing.	Means of producing flame.	Distance of Burner from Fabric.	Duration of Test.	Log.
1. G.	*Non-treated.*	*Direct from Manufactory.*	*Hut No. 2.*	*Suspended over flame.*	*Spirit lamp.*	2¼ *ins.*	*Till consumed*	*The material at once commenced to flame fiercely. It fell down in 18 sec. and was all consumed in 1 min. 40 sec.*
3. G.	*Non-treated, washed by Croydon Laundry.*	*Soaked, washed in warm water, rinsed, dried, starched and ironed.*	*Ditto.*	*Ditto.*	*Ditto.*	2¼ *ins.*	*Till consumed.*	*The material burned very quickly. It fell in 25 sec. and was all consumed in 58 sec.*
5. G.	Croydon Laundry.	Soaked, washed in warm water, rinsed and dried, then steeped for 2 hours in a preparation of "Flameoff," wrung out, dried and ironed.	Ditto.	Ditto.	Ditto.	2¼ ins.	3 mins.	At the conclusion of the test the material was charred upwards for a distance of about 4 ins. The delicate portions were more damaged than in F. 7.
5a. G.	Ditto.	Do.	Committee Room.	Held against flame.	Gas ring.	Direct contact.	1 min.	The material at the conclusion of the test was charred only where in contact with the flame.
7. G.	Ditto.	Do.	Hut No. 2.	Suspended over flame	Spirit lamp.	2¼ ins.	1 min.	The material at the conclusion of the test was charred upwards for a distance of 4 in. from the lower end.
8. G.	Whitley Laundry.	Washed, rinsed and dried, then steeped for 8 hours in a preparation of "Flameoff," taken out, dried and finished in curtain frame.	Ditto.	Ditto.	Ditto.	2¼ ins.	1 min.	The material at the conclusion of the test was charred upwards from the bottom for a distance of 6 ins.
8a. G.	Ditto.	Do.	Ditto.	Held against flame.	Blow-pipe.	Direct contact.	1 min.	The material was only charred where touched by the flame.

GROUP H.—MADRAS MUSLIN CURTAINS.

No. on Sample.	If treated, by whom.	Conditions of Treatment.	Where Tested.	How placed for Testing.	Means of producing Flame.	Distance of Burner from Fabric.	Duration of Test.	Log.
1. *H.*	*Non-treated.*	*Direct from Manufactory.*	*Hut No. 2.*	*Suspended over flame.*	*Spirit Lamp.*	2½ *ins.*	*Till consumed.*	*The material burnt very fiercely, and fell in 15 sec. It was entirely consumed in 35 sec.*
3. *H.*	*Non-treated, washed by Croydon Laundry.*	*Soaked, washed in warm water, rinsed, dried, starched and ironed.*	*Ditto.*	*Ditto.*	*Ditto.*	2½ *ins.*	*Till consumed.*	*The material burnt very quickly, and fell in 15 sec., it was entirely consumed in 65 sec.*
*4. *H.*	*Non-treated, washed by Whitley Lnd.*	*Washed, rinsed, starched, and finished in curtain frames.*	*Hut No. 1.*	*Ditto.*	*Ditto.*	*Direct contact.*	*Till consumed.*	*The material burnt freely, and the flames reached the top in 8 sec. It was entirely consumed in 27 sec.*
5. H.	Croydon Laundry.	Soaked, washed in warm water, rinsed, and dried. Then steeped for 2 hours in a preparation of "Flameoff" wrung out, dried, and ironed.	Hut No. 2.	Ditto.	Ditto.	2½ ins.	1 min.	The flame of the lamp made the balls at the bottom of the curtain incandescent, and at the conclusion of the test the material was charred from the end upwards for 5½ ins.
5a. H.	Ditto.	Do.	Committee Room.	Held against flame.	Gas ring.	Direct contact.	1 min.	The material was only charred where in contact with the flame.
*5b. H.	Ditto.	Do.	Hut No. 1.	Suspended over flame.	Spirit lamp.	Direct contact.	3 min.	The material charred only as far as the power of the flame reached, but the fibre was not destroyed, and at the conclusion of the test the material was charred upwards from the bottom for 11 ins. × 4 ins. The material did not carry flame.
*6. H.	Whitley Laundry.	Washed, rinsed, and dried. Then steeped for 8 hours in a preparation of "Flameoff," taken out, dried, and finished in curtain frames.	Ditto.	Ditto.	Ditto.	Ditto.	1 min.	The material charred only as far as the power of the flame reached, and at the conclusion of the test the material was charred upwards from the bottom 8 ins. × 3 ins. The material did not carry flame.
7. H	Croydon Laundry.	Treated as sample 5. H.	Hut No. 2.	Ditto.	Ditto.	2½ ins.	1 min.	The material was only charred for a distance of 5 ins. up from the end.
8. H.	Whitley Laundry.	Treated as sample 6. H.	Ditto.	Ditto.	Ditto.	Ditto.	1 min.	The material was only charred for a distance of 3½ ins. up from the end.
8a. H.	Ditto.	Do.	Ditto.	Held against flame.	Blow-pipe.	Direct contact.	1 min.	The material was charred where held against flame, and parts adjoining ignited, but went out on removal from the influence of the flame.

*Tested July 22nd, 1908.

GENERAL ARRANGEMENTS.

The tests were carried out according to the procedure laid down by the Executive for investigations of this description, and were conducted by a Sub-Committee, comprising :—

Messrs. Ellis Marsland, *Directing Member* (Dist. Surveyor), *Gen. Hon. Secretary.*
James Sheppard, A.Inst.E.E. (Surveyor, North British and Mercantile Insurance Co.) [*since deceased*].
J. Herbert Dyer (Senior Vice-Pres. Nat. Fire Brigades' Union), J.P.,
R. W. Henderson (Chief Officer Rickmansworth Fire Brigade).
E. J. A. Fulkes (Surveyor Royal Insurance Co.)

Note.—The following did not attend the tests of July 1st :—Mr. James Sheppard, and of July 22nd :—Mr. Fulkes.

Mr. A. H. Lister assisted the Sub-Committee.

The Council was represented for the testing operations of 22nd July, 1908, by :—

Sir James Williamson, C.B. (late Director of H.M. Dockyards).

The Executive was represented for the testing operations of the 1st and 22nd July, 1908, by :—

Mr. Edwin O. Sachs, F.R.S.Ed., *Chairman.*

Also on July 1st by :—

Mr. Max Clarke, F.R.I.B.A.

And also on July 22nd by :—

Mr. Percy Collins, J.P., F.S.S.

The general body of members were represented for the testing operations of July 1st, 1908, by Mr. S. G. Gamble, A.M.Inst.C.E. (Divisional Officer London Fire Brigade), and Louis T, Healy, A.M.Inst.E.E., and on July 22nd by :—

Messrs. Bertram Chatterton, A.M.Inst.C.E. (Surveyor, Yorkshire Insurance Company) ; Louis T. Healy, A.M.Inst.E.E. (Royal Insurance Company) ; Jos. Randall, A.M.Inst.C.E. ; Percy E. Ridley, A.Inst. E.E.

Messrs. The Flameoff Company were represented on July 22nd, 1908, by Messrs. H. Becker and Thomas Streeting.

The following visitors attended at the Testing Station by special invitation of the Executive during the testing operations of July 22nd, 1908 :—

The Rt. Hon. the Earl of Londesborough ; Messrs. Geo. T. Bullock (Union Fire Office) ; A R. Dyer, A.M.Inst.C.E., Assistant Divisional Officer, London Fire Brigade) ; Lt.-Col. Fox (Chief Officer, London Salvage Corps) ; W. H. Hunter (Hand in-Hand Fire Insurance Company) ; W. H. Ross (Messrs. A. L. Gibson & Co.) ; and Wm. Thomson.

Signed,

For the Sub-Committee conducting the test :—
ELLIS MARSLAND.

For the General Testing Arrangements Sub-Committee :—
J. HERBERT DYER,

For the Executive :—
PERCY COLLINS.

Published by the Committee as directed by the Executive.

C. ADAMI,
(*Asst. Secretary*).
Date.—18th November, 1908.

Verified a true copy of the Report as ordered to be published.
ROSE, INNES, SON AND CRICK (*Solicitors*).
Date.—October 27th, 1908.

APPENDIX.

The makers issue the following directions for use .–

DIRECTIONS FOR USE FOR PRODUCING NON-INFLAMMABILITY AND STIFFNESS.

Pour one quart of boiling water quickly over the contents of a box of " Flameoff " ; stir the mixture until every particle is thoroughly dissolved.

The article to be treated with " Flameoff " must be thoroughly dry.

Soak it by covering it well with the hot mixture, place a lid over and leave it until quite cold.

Wring the article out lightly ; hang it up to dry and iron in the usual way.

The iron must only be moderately hot to prevent scorching.

Never mix more " Flameoff " than you require at one time.

DIRECTIONS FOR USE FOR RENDERING ARTICLES NON-INFLAMMABLE ONLY.

Suitable for Bed Linen, Pillow Cases, Sheets, Blankets, Nightdresses, Flannelette, Table Linen, Lace Work, Blinds, Bed Curtains, Furniture Covers, &c.

Pour one quart of hot (not boiling) water quickly over the contents of a box of " Flameoff " ; stir the mixture until every particle is thoroughly dissolved.

The article to be treated with " Flameoff " must be thoroughly dry.

Soak it by covering it well with the hot mixture, place a lid over and leave it until quite cold.

Rinse the article well in the mixture and wring it out lightly ; hang it up to dry and iron in the usual way.

The iron must only be moderately hot to prevent scorching.

Never mix more " Flameoff " than you require at one time.

Note --The following is a copy of the label which was attached to the material used by the Whitley and Croydon Laundries :—

25.

THE NEW YORK PUBLIC LIBRARY
REFERENCE DEPARTMENT

This book is under no circumstances to be taken from the Building